

**REVISED
WORK PLAN
FOR
RI/FS ACTIVITIES
GIBBSBORO, NEW JERSEY**

Work Plan
(Volumes I – III)

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Prepared for:

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**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

Section (Volume I)	Page
SECTION 1.0 INTRODUCTION.....	1-1
SECTION 2.0 SITE BACKGROUND AND PHYSICAL SETTING	2-1
2.1 INTRODUCTION	2-1
2.2 THE PAINT WORKS	2-1
2.2.1 <i>Setting</i>	2-1
2.2.2 <i>Summary of Previous Operations</i>	2-2
2.2.2.1 Introduction.....	2-2
2.2.2.2 John Lucas & Co., Inc.	2-3
2.2.2.3 The Sherwin-Williams Company	2-3
2.2.2.4 Current Operations (The Paint Works Corporate Center)	2-6
2.3 UNITED STATES AVENUE BURN SITE	2-7
2.4 ROUTE 561 DUMP SITE	2-10
2.5 WHITE SAND BRANCH	2-11
2.6 HANEY RUN BROOK	2-12
2.7 BRIDGEWOOD LAKE.....	2-12
2.8 HILLIARD CREEK	2-13
2.9 RAILROAD TRACK SITE.....	2-14
SECTION 3.0 INITIAL EVALUATION OF EXISTING DATA	3-1
3.1 REGIONAL SETTING	3-1
3.1.1 <i>Regional Geology and Hydrogeology</i>	3-1
3.1.2 <i>Population and Environmental Resources</i>	3-2
3.1.3 <i>Water Well Survey</i>	3-4
3.1.4 <i>Land Use</i>	3-5
3.1.5 <i>SOILS</i>	3-7
3.2 HISTORY OF INVESTIGATIONS	3-10
3.2.1 <i>United States Avenue Burn Site</i>	3-10
3.2.1.1 Soil Sampling.....	3-10
3.2.1.2 Sediment	3-25
3.2.1.3 Surface Water.....	3-29
3.2.1.4 Groundwater	3-31
3.2.2 <i>Route 561 Dump Site</i>	3-36
3.2.2.1 Soil	3-36
3.2.2.2 Sediment	3-41
3.2.2.3 Surface Water.....	3-43
3.2.3 <i>White Sand Branch</i>	3-44
3.2.3.1 Sediment	3-44
3.2.3.2 Surface Water.....	3-45

TABLE OF CONTENTS FOR WORK PLAN (VOLUMES I – III)

3.2.4	<i>Haney Run Brook</i>	3-46
3.2.4.1	Sediment	3-46
3.2.4.2	Surface Water.....	3-46
3.2.5	<i>Bridgewood Lake</i>	3-47
3.2.5.1	Sediment	3-47
3.2.5.2	Surface Water.....	3-47
3.2.6	<i>Hilliard Creek</i>	3-47
3.2.6.1	East Of W. Clementon Road.....	3-47
3.2.6.1.2	Remedial Activities At The Seep Area.....	3-50
3.2.6.1.3	Sediment	3-53
3.2.6.1.4	Surface Water.....	3-55
3.2.6.2	West Of W. Clementon Road	3-56
3.2.6.2.1	DEP Investigation	3-56
3.2.6.2.2	US EPA August/September 1998 Investigation	3-57
3.2.6.2.3	US EPA November 1998 Investigation	3-58
3.2.6.2.4	US EPA July 1999 Investigation	3-60
3.2.6.2.5	Removal Action	3-60
3.2.7	<i>Railroad Track Site</i>	3-65
3.2.8	<i>Paint Works</i>	3-68
3.2.8.1	Areas Of Environmental Concern.....	3-68
3.2.8.2	History Of Investigations.....	3-69
3.2.8.3	Contaminant Assessment.....	3-72
3.2.8.3.1	AEC I/III	3-73
3.2.8.3.2	AEC II.....	3-79
3.2.8.3.3	AEC IV	3-80
3.3	PRELIMINARY IDENTIFICATION OF ARARS AND TBCS.....	3-82
3.3.1	<i>Potential Applicable or Relevant and Appropriate Requirements</i>	3-82
3.3.2	<i>“To Be Considered”</i>	3-85
3.4	PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION ALTERNATIVES	3-87
3.4.1	<i>Preliminary Identification of Remedial Action Objectives</i>	3-87
3.4.2	<i>Preliminary Identification of General Response Actions, Remedial Technologies, and Alternatives</i>	3-87
3.4.2.1	Soil Treatment and Disposal.....	3-88
3.4.2.1.1	Excavation and On site or Off site Treatment /Disposal	3-89
3.4.2.1.2	In-Situ Treatment.....	3-89
3.4.2.2	Groundwater Treatment and Disposal	3-89
3.4.2.2.1	On site Treatment /Disposal	3-89
3.4.2.2.2	In-Situ Treatment.....	3-90
SECTION 4.0 WORK PLAN RATIONALE		4-1
4.1	CONCEPTUAL SITE MODEL	4-1
4.2	DATA QUALITY	4-5

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

4.3	WORK PLAN APPROACH	4-5
SECTION 5.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY.....		5-1
5.1	MOBILIZATION.....	5-1
5.1.1	<i>Site Access</i>	5-1
5.1.2	<i>Obtain Necessary Permits</i>	5-1
5.1.3	<i>Clear Site Utilities</i>	5-1
5.1.4	<i>Construct Site Facilities</i>	5-2
5.1.5	<i>Establish Sampling Locations</i>	5-2
5.1.6	<i>Mobilize Equipment and Supplies</i>	5-2
5.1.7	<i>Field Personnel Orientation</i>	5-2
5.2	FIELD INVESTIGATION.....	5-3
5.2.1	<i>United States Avenue Burn Site</i>	5-3
5.2.1.1	Existing Data Assessment.....	5-3
5.2.1.2	Soil	5-3
5.2.1.3	Groundwater	5-5
5.2.1.4	Sediment	5-6
5.2.1.5	Surface Water.....	5-7
5.2.1.6	Ecological Assessment	5-7
5.2.2	<i>Route 561 Dump Site</i>	5-8
5.2.2.1	Existing Data Assessment.....	5-8
5.2.2.2	Soil	5-8
5.2.2.3	Groundwater	5-10
5.2.2.4	Sediment	5-12
5.2.2.5	Surface Water.....	5-12
5.2.2.6	Ecological Assessment	5-12
5.2.3	<i>White Sand Branch</i>	5-13
5.2.3.1	Existing Data Assessment.....	5-13
5.2.3.2	Soil	5-13
5.2.3.3	Groundwater	5-13
5.2.3.4	Sediment	5-14
5.2.3.5	Surface Water.....	5-15
5.2.3.6	Ecological Assessment	5-16
5.2.4	<i>Haney Run Brook</i>	5-17
5.2.4.1	Existing Data Assessment.....	5-17
5.2.4.2	Soil	5-17
5.2.4.3	Groundwater	5-17
5.2.4.4	Sediment	5-18
5.2.4.5	Surface Water.....	5-19
5.2.4.6	Ecological Assessment	5-20
5.2.5	<i>Bridgewood Lake</i>	5-21
5.2.5.1	Existing Data Assessment.....	5-21

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

5.2.5.2	Soil	5-21
5.2.5.3	Groundwater	5-22
5.2.5.4	Sediment	5-23
5.2.5.5	Surface Water.....	5-24
5.2.5.6	Ecological Assessment	5-24
5.2.6	<i>Hilliard Creek</i>	5-25
5.2.6.1	Existing Data Assessment.....	5-25
5.2.6.2	Soil	5-26
5.2.6.3	Groundwater	5-26
5.2.6.4	Sediment	5-26
5.2.6.5	Surface Water.....	5-29
5.2.6.6	Ecological Assessment	5-29
5.2.7	<i>Rail Road Site</i>	5-30
5.2.7.1	Existing Data Assessment.....	5-30
5.2.7.2	Soil	5-31
5.2.7.3	Groundwater	5-32
5.2.7.4	Sediment	5-32
5.2.7.5	Surface Water.....	5-32
5.2.7.6	Ecological Assessment	5-33
5.2.8	<i>Background Location</i>	5-33
5.2.9	<i>Regional Groundwater</i>	5-33
5.2.9.1	Evaluation of Potential Impact to Deeper Aquifers.....	5-33
5.2.9.2	Residential Well Sampling	5-33
5.2.10	<i>Other Data Collection Activities</i>	5-34
5.2.10.1	Title Search	5-34
5.2.10.2	Well Search.....	5-34
5.2.10.3	Expanded Topographic Survey.....	5-35
5.2.10.4	Vacant Lot Investigation.....	5-35
5.2.10.5	Evaluation of Waste Characteristics	5-36
5.2.10.6	Cultural Resources	5-36
5.2.10.7	Investigation Derived Waste (IDW) Characterization and Disposal.....	5-36
5.3	SAMPLE ANALYSIS AND VALIDATION	5-37
5.3.1	<i>Data Validation</i>	5-37
5.3.2	<i>Sample Tracking</i>	5-37
5.4	DATA EVALUATION	5-37
5.5	RISK ASSESSMENT	5-38
5.5.1	<i>Public Health Evaluation</i>	5-39
5.5.1.1	Selection of Contaminants of Potential Concern.....	5-40
5.5.1.2	Evaluation of Receptors and Exposure Point Concentrations	5-40
5.5.1.3	Development of Exposure Scenarios	5-40
5.5.1.4	Characterization of Toxicity Potential.....	5-41

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

5.5.1.5	Generation of Risk Calculations and Discussion of Risk Outcome	5-41
5.5.1.6	Discussion of Uncertainties Associated with the Risk Assessment	5-42
5.5.2	<i>Environmental Assessment</i>	5-42
5.5.2.1	SLERA Approach	5-42
5.5.2.2	Specific Elements of the SLERA.....	5-42
5.5.2.2.1	Screening Level Problem Formulation	5-42
5.5.2.2.2	Environmental Setting and Contaminants of Potential Concern (COPCs).. 5-43	
5.5.2.2.3	Contaminant Fate and Transport.....	5-43
5.5.2.2.4	Ecotoxicity	5-43
5.5.2.2.5	Complete Exposure Pathways and Potential Receptors	5-43
5.5.2.2.6	Assessment and Measurement Endpoints for the SLERA.....	5-45
5.5.2.2.7	Screening Level Effects Evaluation.....	5-45
5.5.2.2.8	Screening-Level Exposure Estimate And Risk Calculation	5-46
5.5.2.2.9	Screening-Level Exposure Estimates	5-46
5.5.2.2.10	Screening-Level Risk Calculations.....	5-46
5.5.2.2.11	Risk Summary.....	5-46
5.5.2.3	BERA Approach	5-47
5.6	TREATABILITY STUDIES - PILOT TESTING.....	5-48
5.7	REMEDIAL INVESTIGATION REPORTS	5-48
5.8	REMEDIAL ALTERNATIVES DEVELOPMENT AND SCREENING	5-48
5.8.1	<i>Development of Remedial Action Objectives and General Response Actions.</i> 5-49	
5.8.2	<i>Identification and Screening of Applicable Technologies and Development of Alternatives</i>	5-49
5.8.3	<i>Screening of Remedial Alternatives</i>	5-50
5.8.3.1	Effectiveness Evaluation.....	5-50
5.8.3.2	Implementability Evaluation.....	5-50
5.8.3.3	Cost Evaluation.....	5-51
5.8.4	<i>Detailed Evaluation of Remedial Alternatives</i>	5-51
5.8.4.1	Evaluation Criteria.....	5-51
5.8.4.2	Short-Term Effectiveness	5-51
5.8.4.3	Long-Term Effectiveness.....	5-52
5.8.4.4	Reduction of Toxicity. Mobility, or Volume	5-52
5.8.4.5	Implementability	5-52
5.8.4.6	Cost	5-52
5.8.4.7	Compliance with ARARs	5-53
5.8.4.8	Overall Protection of Human Health and Its Environment.....	5-53
5.8.4.9	State Acceptance.....	5-53
5.8.4.10	Community Acceptance.....	5-53
5.9	FEASIBILITY STUDY REPORT	5-53
5.9.1	<i>FS Report Preparation</i>	5-53

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

5.10	PROJECT MANAGEMENT PLAN.....	5-54
5.10.1	<i>Data Management</i>	5-54
5.10.2	<i>Periodic Reports</i>	5-56
SECTION 6.0	SCHEDULE.....	6-1
SECTION 7.0	PROJECT MANAGEMENT.....	7-1
SECTION 8.0	REFERENCES.....	8-1

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

LIST OF FIGURES (Volume II)

<u>Title</u>	<u>Figure</u>
2-1	Topographic Quadrangle Map
2-2	Site Location Map
2-2A	UGGS Topographic Map, 1898
2-3	The Paint Work Corporate Center Site Plan
2-4	Historic Site Plan
2-5	United States Avenue Burn Site Topographic Map
2-6	Route 561 Dump Site Topographic Map
2-7	Wetland Map
2-8	Existing Groundwater Monitoring Well Locations
3-1	Geology Map
3-2	Water Supply Wells
3-3	Locations of Private Wells
3-4	Land Use Map
3-5	Soil Classification Map
3-6	Contaminant Distribution Map-Burn Site
3-7	Contaminant Distribution Map-Burn Site, Lead Profiles
3-8	Groundwater Contaminant Distribution Map-Burn Site
3-9	Contaminant Distribution Map-Dump Site
3-10	Contaminant Distribution Map-Dump Site, Lead Profiles
3-11a	Contaminant Distribution Map-Hilliard Creek-165 Kirkwood Dr
3-11b	Contaminant Distribution Map-Hilliard Creek-Steven's Drive
3-11c	Contaminant Distribution Map-Hilliard Creek-East of Glenview Dr
3-11d	Contaminant Distribution Map-Hilliard Creek-East of Hilliard Rd
3-11e	Contaminant Distribution Map-Hilliard Creek-East of Hilliard Rd
3-11f	Contaminant Distribution Map-Hilliard Creek-West of W. Clementon Rd./ Gibbsboro Rd.
3-11g	Contaminant Distribution Map-Hilliard Creek- West of W. Clementon Rd./ Gibbsboro Rd
3-11h	Contaminant Distribution Map-Hilliard Creek-East of Clementon Rd
3-12a	Contaminant Distribution Map-Hilliard Creek-165 Kirkwood Drive-Lead Profiles
3-12b	Contaminant Distribution Map-Hilliard Creek-Steven's Drive- Lead Profiles
3-12c	Contaminant Distribution Map-Hilliard Creek-East of Glenview Drive-Lead Profiles
3-12d	Contaminant Distribution Map-Hilliard Creek-East of Hilliard Rd- Lead Profiles
3-12e	Contaminant Distribution Map-Hilliard Creek-East of Hilliard Rd-Lead Profiles

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

**LIST OF FIGURES (Volume II)
continued**

3-12f	Contaminant Distribution Map-Hilliard Creek-West of W. Clementon Rd./Gibbsboro Rd.-Lead Profiles
3-12g	Contaminant Distribution Map-Hilliard Creek-East of Clementon Rd
3-12h	Contaminant Distribution Map-Hilliard Creek-East of Clementon Rd
5-1	United States Avenue Burn Site Sampling Locations Map
5-2	Route 561 Dump Site Sampling Locations Map
5-3	Haney Run Brook Sampling Locations Map
5-4	White Sand Branch Sampling Locations Map
5-5	Bridgewood Lake Sampling Locations
5-6	Hilliard Creek Sampling Locations Map
5-7	Potential Background Location Map
5-8	Vacant Lot Investigations Map
5-9	Rail Road Site Sampling Location Map
6-1	Schedule

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

LIST OF TABLES (Volume III)

<u>Title</u>	<u>Table</u>
2-1	Inventory of Former Storage Tanks
3-1	Summary of Residential Well Surveys
3-2	List of RCRA Notifiers
3-3	Summary of Analytical Data, Soil Samples, Burn Site
3-4	Sample Summary Statistics – U.S. Avenue Burn Site
3-5	Summary of Analytical Data, Sediment Samples, Burn Site
3-6	Summary of Analytical Data, Surface Water Samples, Burn Site
3-7	Summary of Analytical Data, Groundwater Samples, Burn Site
3-8	Summary of Analytical Data, Soil Samples, Dump Site
3-9	Summary of Analytical Data, Sediment Samples, Dump Site
3-10	Summary of Analytical Data, Surface Water Samples, Dump Site
3-11A	Summary of Groundwater Analytical Data – VOCs – Dump Site
3-11B	Summary of Groundwater Analytical Data – SVOCs – Dump Site
3-11C	Summary of Groundwater Analytical Data – Metals – Dump Site
3-12D	Summary of Groundwater Analytical Data – Pesticides/PCBs – Dump Site
3-12	Summary of Analytical Data, Soil Samples, Hilliard Creek Site
3-13	Summary of Analytical Data, Sediment Samples, Hilliard Creek Site
3-14	Summary of Analytical Data, Surface Water Samples, Hilliard Creek Site
3-15	Frequency of Detections, Soil, AEC I/III
3-16	Frequency of Detections, Groundwater, AEC I/III
3-17	Frequency of Detections, Soil, AEC II
3-18	Frequency of Detections, Groundwater, AEC II
3-19	Frequency of Detections, Soil, AEC IV
3-20	Frequency of Detections, Groundwater, AEC IV
7-1	Key Project Contacts

**TABLE OF CONTENTS
FOR WORK PLAN
(VOLUMES I – III)**

LIST OF APPENDICES (Volume I)

APPENDIX A	-	HISTORICAL WASTE ANALYSES DATA
APPENDIX B	-	ZONING MAPS
APPENDIX C	-	KASELAAN & D'ANGELO REPORT
APPENDIX D	-	WETLAND DELINEATION REPORT
APPENDIX E	-	RESIDENTIAL WELL ANALYTICAL RESULTS
APPENDIX F	-	RAILROAD TRACK SITE MAP
APPENDIX G	-	RI AND FS REPORT SAMPLE TABLE OF CONTENTS
APPENDIX H	-	HISTORIC MAPS

SECTION 1.0

INTRODUCTION

On behalf of The Sherwin-Williams Company (Sherwin-Williams), Weston Solutions, Inc. (Weston[®]) has prepared this Work Plan pursuant to requirements of an Administrative Order on Consent (AOC), Index No. II CERCLA-02-99-2035, issued by the United States Environmental Protection Agency (US EPA) on 4 October 1999, which became effective on 6 October 1999. The purpose of the AOC is to perform a Remedial Investigation/Feasibility Study (RI/FS) at several sites, which, are named in the AOC are: the United States Avenue Burn site, Route 561 Dump site, and Hilliard Creek located in Gibbsboro, Camden County, New Jersey.

This Work Plan describes the activities that will be performed to fulfill the requirements of the AOC. The objectives of these activities are to:

- Determine the nature and extent of contamination and any threat to the public health, welfare, or the environment caused by any release or threatened release of hazardous substances, pollutants, or contaminants in connection with the sites, by conducting a remedial investigation (RI); and
- Determine and evaluate, through the conducting of a feasibility study (FS), alternatives for the remediation or control of any release or threatened release of hazardous substances, pollutants, or contaminants, in connection with the sites.

The activities conducted by or on behalf of Sherwin-Williams under this AOC will be conducted in compliance with the “Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA” and all other applicable US EPA guidance, policies, and procedures and any amendments thereto.

SECTION 2.0

SITE BACKGROUND AND PHYSICAL SETTING

2.1 INTRODUCTION

The sites addressed in this AOC are located in Gibbsboro, Camden County, New Jersey, within the Atlantic Coastal Plain physiographic province (Figure 2-1). A portion of the Hilliard Creek site is situated within Voorhees Township. These sites and the surrounding area are located within the United States Geological Survey (USGS) Clementon 7.5 Minute Quadrangle. Residential and manufacturing activities have occurred in Gibbsboro for over 200 years.

For ease of reference the area of the investigations has been subdivided into sites or areas, on a geographic basis. Seven areas have been designated:

- United States Avenue Burn Site
- Route 561 Dump Site
- White Sand Branch
- Haney Run Brook
- Bridgewood Lake
- Railroad Track Site
- Hilliard Creek Site

Up until 1977, Sherwin-Williams operated in Gibbsboro a paint manufacturing plant. The former plant site is currently utilized as an office and light industrial park and is called The Paint Works Corporate Center (The Paint Works). The Paint Works is not covered by this AOC, but a discussion of The Paint Works is provided for the understanding of the history of the sites addressed under the AOC.

2.2 THE PAINT WORKS

2.2.1 Setting

The Paint Works is located in Gibbsboro, Camden County, New Jersey (Figure 2-2), and encompasses approximately 60 acres. It is bounded to the north by Silver Lake and Route 561, to the east by United States Avenue, to the west by Clementon-Gibbsboro Road, and to the south by vacant land, a cemetery and Bridgewood Lake.

In the early 1980s, the developer Robert K. Scarborough (Scarborough) purchased a majority of the land occupied by the former Sherwin-Williams facility and transformed the manufacturing facility into a light industrial complex. Development of the site included demolition or

renovation of existing structures, extensive civil works, installation of septic systems and construction of new office, manufacturing, and warehouse space. The current site layout is presented on Figure 2-3. A historic map showing locations of the old buildings is provided in Figure 2-4. The current status of these buildings (e.g., razed) is provided. On 5 December 1997, The Paint Works was sold to Brandywine Realty Trust (Brandywine).

The northern boundary of the Paint Works is defined by Silver Lake. This lake discharges to Hilliard Creek, which traverses the property in a northeast-southwest-trending direction. The Paint Works is bisected by Foster Avenue. The portion of the site to the north of Foster Avenue is occupied by various buildings. The grounds surrounding the buildings are paved and serve as parking lots. The northernmost part of the property along United States Avenue, north of all the buildings is a gravel parking lot. The area immediately south of Foster Avenue is occupied by buildings and is surrounded by paved parking lots. To the south of the former Academy Paints building (also referenced as former building 67 during Lucas/Sherwin Williams ownership' in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4), the site is undeveloped. The type of ground cover in this area is variable.

Generally, the topographic gradient is from northeast to southwest. Because the site is developed, surfaces are flat and graded towards storm water collection points. Near Hilliard Creek and Bridgewood Lake, the topographic gradient slopes gently towards these water bodies.

2.2.2 Summary of Previous Operations

2.2.2.1 Introduction

The property was originally developed around the turn of the 19th century as a sawmill and, subsequently, a grain mill. In 1851, the John Lucas & Co., Inc. (Lucas) purchased the property and converted the existing mill into a paint and varnish manufacturing facility. Pursuant to an agreement dated December 24, 1929 between The Sherwin-Williams Company, an Ohio Corporation, and John Lucas & Co., Inc., a Pennsylvania corporation, it appears that The Sherwin-Williams Company created a new corporation incorporated under the laws of Delaware known as John Lucas & Co., Inc. It appears that from 1930 to 1935, John Lucas & Co., Inc., the Delaware Corporation, was operated as a subsidiary of The Sherwin-Williams Company. On or about August 14, 1935, a corporation known as John Lucas & Co., Inc., a Maryland Corporation was formed. In accordance with a Certificate of Agreement of Merger of John Lucas & Co., Inc., a Maryland corporation, into The Sherwin-Williams Company, an Ohio corporation, was filed on August 28, 1967.

Sherwin-Williams closed the facility permanently on 1 September 1978. In June of 1981, after nearly 3 years of inactivity, a majority of the property was sold to developer Robert K. Scarborough. Scarborough developed the former manufacturing facility into a light industrial complex named "The Paint Works Corporate Center". At present, approximately 20 tenant

companies occupy office, warehouse, and manufacturing space at the site. On 11 December 1997, The Paint Works was sold to Brandywine.

2.2.2.2 John Lucas & Co., Inc.

The property was originally developed around the turn of the 19th century as a sawmill and, subsequently, a grain mill. In 1851, Lucas purchased the property and converted the existing mill into a paint and varnish manufacturing facility.

Lucas developed and manufactured oil-based paints, varnishes, and lacquers at the Gibbsboro facility. The scale of these operations remained relatively small and occupied only a portion of the current 60-acre property. The primary products manufactured by Lucas at the facility were varnish and lacquer. Other products included:

- Dry colors produced from chemical reactions, blending, filtering, and drying.
- Oil-based paints produced from grinding pigments in oil and adding thinners, oils, and dryers.
- Ready-mixed linseed oil paints produced from blending linseed oil with pigments and thinners.

Based on available information, raw materials used by Lucas may have included lead oxide, zinc oxide, lead chromate, ferrous sulfate, sulfuric acid, linseed oil, and various paint solvents, among others. During the 1880s, storage tanks for vegetable oils and other raw materials were installed in an area referred to as Tank Farm Area A. In 1887, a rail spur was installed at the facility to provide for improved transportation and handling of the raw materials and finished goods.

2.2.2.3 The Sherwin-Williams Company

Operations at the facility expanded in the 1930s. Office and manufacturing facilities occupied approximately one-third of the property, with the center of these facilities located around Foster Avenue. During the 1930s, Sherwin-Williams terminated dry color production, but the facility continued to produce oil-based paints, varnishes, lacquers (starting in the 1950s), and emulsion paints until December of 1975. In 1956, Sherwin-Williams began production of alkyd or synthetic varnish, but this operation was terminated in December of 1975. Between December of 1975 and early 1977, the facility produced emulsion paints only.

Raw materials were stored in aboveground storage tanks (ASTs) and underground storage tanks (USTs) in two areas at the site, presently referred to as Tank Farm Areas A and B (see Figures 2-3 and 2-4). An inventory of the tanks formerly at the facility, including tank sizes and the materials stored, is shown in Table 2-1. In addition to these tanks, an 8,000-gallon railroad tanker car containing No. 6 fuel oil was maintained within the northeastern portion of the site, along United States Avenue. All ASTs and USTs were dismantled and removed from the site by

Scarborough upon purchase of the property. Documentation is not available concerning the details of the tank removal activities undertaken by Scarborough and the condition of the ASTs and USTs at the time of removal.

According to information provided by Sherwin-Williams, raw materials (i.e., paint pigments) were also stored in 55-gallon drums. Raw materials and finished goods were typically stored in former Buildings 55, 56, 57, 58 (also referenced as the former Scotko Sign & Display, Inc. building in portions of this RI/FS Work Plan and in Figure 2-3), 62, and 67 (also referenced as the former Academy Paints building in portions of this RI/FS Work Plan and in Figure 2-3). The building housing the former Scotko Company (former building no. 58) used to contain a solvent pump house for SWC. Figure 2-3 presents an overview of the historic layout of the former manufacturing facility. The figure also notes which buildings are still standing and which have been removed. The date of the drawing is not noted.

Wastewater generated from the manufacturing process was treated and disposed of at the facility between 1950 and 1977. Wastewater disposal was limited to the southern portion of the site. These areas are currently referred to as the former lagoon area and the former landfill area (see Figures 2-2 and 2-3). Wastewater was discharged by gravity from the manufacturing facility to a lift station and subsequently pumped to a 27,000-gallon concrete holding basin. Alum was added to the wastewater, and then the wastewater was gravity fed from the basin to Lagoon 1 for coagulation and settling. The wastewater was then transferred to Lagoons 2, 3, and 4 for biological treatment (Figure 2-4).

Many sample test results of the waste material were collected from 1977 to 1979. The sampling performed consisted primarily of waste classification sampling conducted for the proper disposal of all sludge material located in the holding ponds, percolation ponds and waste piles. Other sampling was performed to address smaller waste streams. Specifically, latex acrylic paint sludge and dye waste was sampled separately from sludge in the lagoons. These two waste streams were classified as 'Special Waste'.

Analyses consisted of "Mercury Analysis", "Semi-quantitative Spectrographic Analysis" (Ba, Si, Ca, Mg, Fe, Al, V, Na, Sr, P, Mn, Pb, Ni, Ti, Zr, B, Cr, Mo, Sn, Cu, Ga, Ag), "Chemical Analysis" (CaCO₃, BaSO₄, CaSO₄, FeO, NaCl, Ca(OH)₂, CaS, SiO₂ and Hg), "Leachate Analysis of Brine Sludge" (Barium, Copper, Total Iron, Lead, Mercury, Chloride, pH, COD, TDS and TSS), "Leachate Analyses" of sludge material (arsenic, barium, cadmium, hexavalent chromium, fluoride, copper, total iron, lead, manganese, mercury, nickel, selenium, sodium, zinc, cyanide, fluoride, nitrate, pH, phenolic compounds, oil, sulfate, TDS, chlorides, total kjeldahl nitrogen, total phosphorus, sulfate, chlorinated hydrocarbons, benzene and PCBs), "Leachate Testing" on spent iron filings (aluminum, arsenic, barium, cadmium, hexavalent chromium, copper, iron, lead, manganese, mercury, nickel, selenium, sodium, zinc, cyanide, chloride, fluoride, surfactants, nitrate, grease and oil, sulfate, TDS, COD, TOD, p-nitrobenzoyl chloride, TCE and phenol); "Semi-quantitative Spectrographic Analysis" testing (aluminum,

barium, calcium, chromium, iron, lead, magnesium, nickel, silicon, sodium, strontium, potassium, titanium, copper), leachate testing (pH, TDS, TSS, chloride, sulfate, color, turbidity, barium, manganese, boron, cadmium, copper, chromium, mercury, nickel, silver, zinc, lead TOC and selenium), “Chemical Testing” (pH, barium, cadmium, lead, BOD, COD, TDS, TSS, color, chlorides, nitrates, zinc, titanium fecal coliform and phenols) and “Chemical Analysis by Gas-Liquid Chromatography” (total octanes, total xylenes, N-Heptane, benzene and toluene) on wastewater. All analysis was performed using procedures from the 14th edition of Standard Methods for the Examination of Water and Wastewater and the US EPA manual of Methods, 1974.

Available data and correspondence related to analytical samples associated with disposal activities are provided in Appendix A.

A review of the data indicates that the waste material generated at the site was classified generally as ID-27 (industrial – non-hazardous). Specifically, the contents of the sludge material identified in the holding ponds and percolation ponds was non-hazardous (i.e., none of the analytes were detected in concentrations above hazardous levels. Smaller quantities of material were generated and disposed of as ‘Special Waste’. The material disposed of as special waste was generated and stored separately from the waste material, which treated as part of the plants waste water treatment process. It appears as the though the waste was given the ‘Special Waste’ identification based on the presence of free-solvent in the samples collected for laboratory analysis.

The sampling indicated that the presence of VOCs in the holding and percolation ponds. The total concentration of VOCs identified in these ponds ranged from 15 ppm to 1,990 ppm. The highest levels, 1,820 ppm and 1,990 ppm, were seen in holding ponds 4 and 3, respectively. Specific volatile compounds were not identified as part of the sampling protocol, only the total amount of volatile organic compounds was reported.

Sludge was removed periodically from the lagoons and transferred to an adjacent sludge disposal pit area located east of United States Avenue across from the wastewater treatment lagoons. This area occupies portions of Blocks 23 and 25. The sludge was placed in three pits located within this 4-acre area. Historical records confirm that this area was also leased and operated by the Borough of Gibbsboro for the disposal of municipal refuse. Records also show that domestic and municipal wastes were spread throughout the pit area and burned nightly.

Sherwin-Williams records from the early 1970s (invoices and work authorizations) indicate that wastes such as solvents and paint sludges were hauled off site for disposal. Sherwin-Williams records also indicate that the facility had a recycling system in place for reworking old or discontinued products into its active processes.

Historical information indicates that four fires occurred at the manufacturing facility between 1905 and 1949. The first two fires occurred during Lucas' operations: the first fire occurred in 1905 in Building 32, the Varnish Filter House, where varnish was thinned and filtered; the second fire occurred on 18 September 1915 inside Building 39, which was used as a dry color paint mill at the time of the fire. Following the purchase of Lucas by Sherwin-Williams, two additional fires occurred: the first fire occurred on 21 February 1930 and destroyed Building 36, a warehouse used to store raw materials (following the fire the former Building 36 concrete foundation pad was used for exterior storage of drummed materials); the second fire occurred on 30 July 1949 and destroyed approximately 1,000 drums of nitrocellulose and lacquer.

Sherwin-Williams terminated production at the Gibbsboro facility in late 1976 and early 1977. The entire operation and facility were permanently closed on 1 September 1978.

2.2.2.4 Current Operations (The Paint Works Corporate Center)

In June of 1981, after nearly 3 years of inactivity, the portion of the property used for manufacturing activities was sold to developer Scarborough. Scarborough developed the former manufacturing facility into a light industrial complex named "The Paint Works Corporate Center," which includes small warehouses, light manufacturing facilities, and office space. Since the opening of The Paint Works, several tenants have conducted manufacturing operations that involved the use of hazardous materials and the generation of hazardous wastes. Two of the largest hazardous waste-generating tenants were Academy Paints (also referenced as former building 67 during Lucas/Sherwin Williams ownership in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4), and Scotko Sign & Display Company (also referenced as former building 58 during Lucas/Sherwin-Williams' ownership in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4). Both Academy Paints and Scotko Sign & Display, Inc. were listed by the US EPA as large-quantity generators (federal definition). Scotko was listed as generating D001, F003, and F005 wastes. Both have terminated their leases and left the site.

In January 1990, the NJDEP issued a Spill Act Directive to address a seep observed at the property. In October 1990 the Sherwin-Williams entered into an Administrative Consent Order (ACO) with the NJDEP to conduct an RI/FS at The Paint Works. In May 1995 the ACO was amended, to address areas of Immediate Environmental Concern. In July 2001 the NJDEP unilaterally terminated the ACO. Further discussion regarding work performed under NJDEP oversight is presented in Section 3.2.8.

2.3 UNITED STATES AVENUE BURN SITE

The United States Avenue Burn site is located east and south of the former manufacturing complex and immediately to the east of United States Avenue. The United States Avenue Burn site is comprised of portions of Block 22, Lot 1, Block 23, Lot 1, and Block 25, Lot 1, located in Gibbsboro, New Jersey. Figure 2-2 shows the location of the United States Avenue Burn site. Figure 2-5 presents a topographic survey of the United States Avenue Burn site.

Pursuant to an agreement dated December 24, 1929 between The Sherwin-Williams Company, an Ohio Corporation, and John Lucas & Co., Inc., a Pennsylvania corporation, it appears that The Sherwin-Williams Company created a new corporation incorporated under the laws of Delaware known as John Lucas & Co., Inc. It appears that from 1930 to 1935, John Lucas & Co., Inc., the Delaware Corporation, was operated as a subsidiary of The Sherwin-Williams Company. On or about August 14, 1935, a corporation known as John Lucas & Co., Inc., a Maryland Corporation was formed. In accordance with a Certificate of Agreement of Merger of John Lucas & Co., Inc., a Maryland corporation, into The Sherwin-Williams Company, an Ohio corporation, was filed on August 28, 1967.

John Lucas & Co., Inc. acquired the Block 23, Lot 1, and Block 25, Lot 1 before 1935. Sherwin-Williams sold Block 23, Lot 1, and Block 25, Lot 1 to the Ward Sand and Materials Company in 1981. Ward Sand and Materials Company currently owns the property.

Block 22, Lot 1, is currently owned by Progressions Residential Centers, Inc., and R+H Associates.

During the course of their operations, Lucas/Sherwin-Williams discarded waste materials associated with the manufacturing activities. Based on testimony of former employees during the Buzby landfill litigation (a former landfill located a few miles north of the site), which depositions were provided to the US EPA pursuant to its request, it appears that Sherwin-Williams/Lucas used the landfill area of the United States Avenue Burn Site as a landfill up until about 1972. A few existing requisitions also indicate that this area was used for the disposal of plant trash. Based on the types of trash sent at later dates and testimony relating thereto, Sherwin-Williams believes that the trash disposed of at the landfill included empty pigment bags, paint cans, broken pallets and other routine plant trash. Paint wastes and used solvents may also have been burned at the Burn Area (Block 23, Lot 1) of the United States Avenue Burn Site. Reportedly, most of the discarded paint and solvents were used as boiler fuel. Based on Borough records, the debris was burned immediately (within 24 hours) after placement at the site. In addition, the sludges from the on-site lagoons that received latex/water-based paint waste and sewage waste were dredged out of the lagoons on an annual or bi-annual basis and disposed of at the Burn Site. Sherwin-Williams constructed bermed storage areas within Block 25, Lot 1 (which is currently referred to as the Former Landfill Area) to store the wastewater sludge and used the bermed areas between 1950 and 1977.

The Borough of Gibbsboro also utilized the site for disposal and burning of municipal waste. Existing records indicate that unauthorized dumping by residents continued after the Borough officially ceased to utilize the site for disposal of municipal waste, until the Lucas/Sherwin-Williams took measures to block off trails and access roads.

The NJDEP inspected the Former Landfill Area (Block 25, Lot 1) on 31 July and 16 September 1975. The inspections included the sampling of four existing monitoring wells, which had been installed by Sherwin-Williams in 1974. The NJDEP resampled the wells on 5 May 1976. Based on the results of the two sampling rounds, the NJDEP determined that Sherwin-Williams' treatment and disposal practices had impacted groundwater quality.

In 1976, the NJDEP directed Sherwin-Williams to conduct a subsurface investigation in the Former Landfill Area (Block 25, Lot 1). Municipal waste, consisting of household waste, commercial wastes, construction debris, and discarded automobiles, was encountered in the soil borings throughout this area. The layers of municipal waste ranged in thickness from 2 to 10 feet. Sludge was encountered at thicknesses of up to 5 feet in the soil borings completed within the three pits.

On 17 August 1978, the NJDEP issued an Administrative Order (AO) to Sherwin-Williams. The AO required Sherwin-Williams to remove all sludges and contaminated soil from the sludge pit area within the Former Landfill Area by 1 January 1979. The AO also required groundwater monitoring of the Landfill Area.

Closure of the Former Landfill Area was performed between October and December 1979. A total of 557 cubic yards of sludge material was removed from the Former Landfill Area. Removal activities were performed under the direction and oversight of NJDEP. NJDEP approved the closure activities on 19 May 1981. Information regarding this closure and related NJDEP correspondence were provided to the US EPA by Sherwin-Williams on 8 March 1996.

On 31 January 1990, NJDEP issued a directive to Scarborough and Sherwin-Williams to conduct an RI/FS at the former manufacturing facility, including the Former Landfill Area. In September 1990, Sherwin-Williams entered into an Administrative Consent Order (ACO) to conduct the RI/FS. Between 1992 and 2000, Sherwin-Williams collected soil, sediment, groundwater and surface water samples as part of the RI/FS.

In 1994, the NJDEP conducted a Preliminary Assessment (PA) and Site Investigation (SI) at the site.

In response to another NJDEP Directive, Sherwin-Williams constructed a chain-link fence around the portion of Block 23, Lot 1 that NJDEP considered to be an immediate environmental concern (IEC) in July 1995. This included the area containing visible burnt waste.

On 29 September 1995, Sherwin-Williams entered into an AOC with the US EPA to conduct a removal action investigation at the United States Avenue Burn Site. Under that Order, Sherwin-Williams conducted an extensive investigation and installed a fence around the site to prevent access.

Today the site is vacant and fenced to prevent access. The site is utilized by Ward Sand and Gravel Company to satisfy the Borough's requirement for a buffer around their operations.

The United States Avenue Burn Site is located within the Cooper River Watershed, which encompasses an area of approximately 40 square miles. Headwaters of the Cooper River originate approximately 0.7 mile south of Block 23, Lot 1, and flow in the river is northwest through the city of Camden to the Delaware River. Land use in this watershed is identified as primarily urban and suburban.

Haney Run Brook, which traverses Block 25, Lot 1, flows toward the northwest from near the eastern boundary of the lot to near the center of the northern boundary. White Sand Branch, which bisects the northern portion of Block 23, Lot 1, flows toward the southwest and connects with Haney Run Brook near the center of Block 23, Lot 1. Haney Run Brook discharges into Bridgewood Lake via culverts, which run beneath United States Avenue. Bridgewood Lake, located directly west of the site, discharges in a southwesterly direction directly into the main branch of Hilliard Creek. Hilliard Creek eventually discharges into the Cooper River at a point located approximately 1.2 miles west of United States Avenue.

Figures 2-2 and 2-5 provide topographic features and contours in the vicinity of the United States Avenue Burn Site. Based on this topographic information and site visits, it was determined that most surface water runoff generated from the southwestern portion of Block 22 and the fenced portion of Block 23, Lot 1 discharges directly into White Sand Branch. Surface water runoff from the Former Landfill Area (Block 25, Lot 1) and the southern portion of Block 23, Lot 1 flows toward Haney Run Brook.

The land surface of Block 23, Lot 1 and Block 25, Lot 1 is comprised of well-drained soils and vegetative cover, and retention time is low. Storm water will infiltrate surficial soils and in heavy storm events will discharge directly to the creeks or lake.

A portion of Block 23, Lot 1 adjacent to White Sand Branch, has been classified by the U.S. Department of the Interior, Fish and Wildlife Service (DOI FWS) as PSS1. This classification is defined as a scrub-shrub palustrine ecological system consisting primarily of broad-leaved deciduous vegetation. A field wetland delineation conducted in the vicinity of the fenced portion of Block 23, Lot 1 in March 1995 by Weston confirmed the presence of freshwater wetlands and/or state-regulated open waters. The U.S. FWS NWI Map of Clementon, NJ identified palustrine forested (broad-leaved deciduous and needle-leaved deciduous) wetlands adjacent to Haney Run

Brook in Block 25, Lot 1 and palustrine scrub-shrub (broad-leaved deciduous) wetlands adjacent to White Sand Branch, north of Block 23.

The history of environmental investigations is further discussed in Section 3.0.

2.4 ROUTE 561 DUMP SITE

This is a vacant, fenced property, located on Route 561 near Milford/Kresson Road, in the Borough of Gibbsboro, Camden County, New Jersey. Figure 2-2 depicts the site location. Figure 2-6 presents a topographic survey of the Route 561 Dump site.

The site includes Block 18.07, Lot 9, and Lot 10, and small portions of Block 14.02, Lot 1, and Block 18.04, Lot 99, as depicted on tax maps for the Borough of Gibbsboro. The site is bordered to the north by the Continental Plaza shopping plaza, to the east and northeast by White Sand Branch and Clement Lake, to the south by a private residence, and to the west by Route 561. The shopping plaza includes a dry cleaner, convenience store, and a pizzeria. White Sand Branch originates at Clement Lake and flows along the eastern boundary of the site. The eastern-central portion of the site is occupied by a wetland. The limited information regarding disposal history at this site is presented below.

According to available records the site was originally owned by John Lucas & Co., Inc. from some time prior to 31 August 1935. On 5 April 1946 the site was transferred from John Lucas & Co., Inc. to Charles Hollinger. As stated previously, John Lucas & Co., Inc. became a subsidiary of Sherwin-Williams in 1931. According to the *Final Hazard Ranking System Evaluation*, developed in March 1998 by US EPA for the Route 561 Dump Site, US EPA purports the site was previously used as a paint waste dump related to the operations of the Lucas/Sherwin-Williams' paint and varnish manufacturing facility located in Gibbsboro, NJ. The site was proposed for the National Priority List (NPL) on July 28, 1998 but has not been placed on the final NPL as of the writing of this RI/FS Work Plan.

A Site Investigation performed in 1994 by the NJDEP's Office of Site Assessment (OSA) reported that Mr. Lew Wacker, son of the former landowner and landowner of an adjacent parcel, stated that the site was purchased from Mr. Charles Hollinger. According to an NJDEP file memorandum, Mr. Wacker said that "his father told him that Mr. Hollinger said the waste was not harmful and that Lucas would place fill on it in any case".

US EPA's Aerial Photographic Analysis dated May, 1996 ("1996 Aerial Analysis") noted areas of bare soils and sparse vegetation during the 1940's and early 1950's. In discussing the 1940 imagery, the 1996 Aerial Analysis states that "The vegetation at the site is sparse when compared to the surrounding area. The ground at the site appears dark, as if it is wet." Further, US EPA's Aerial Photographic Analysis dated June, 1997 ("1997 Aerial Analysis"), in discussing a 1946 imagery, states that "Bare ground covers much of the site. A small pond of

standing liquid, with wet soil adjacent to it, has formed behind a small wall in the southern section of the site.” According to US EPA, the 1940 and 1951 aerials noted in the 1996 Aerial Analysis indicate the evidence of the remains of a dirt thoroughfare leading from Sherwin-Williams’ Gibbsboro paint manufacturing facilities and that this thoroughfare continues past both United States Avenue and Route 561 into an area contiguous with what is now known as the Route 561 Dump Site. Sherwin-Williams asserts that during the timeframe of these aerials, John Lucas & Co., Inc., a subsidiary of Sherwin-Williams, owned the Gibbsboro paint manufacturing facilities, and, until April 1946, also owned the property that encompasses the Route 561 Dump Site. In discussing the 1973 imagery, the 1996 Aerial Analysis states that “There is no evidence that material has been dumped at this location. Analysis of the 1962, 1965, and 1970 photographs revealed a steady revegetation of this area.” Not until the 1984 photographs does US EPA’s 1996 Aerial Analysis note “Material has been disposed of at this Site. A fill face delineates the extent of the material. This material was not present on the 1979 photographs.” This timeframe is after Sherwin-Williams ceased operations and during the time when the Paint Works was being redeveloped.

Since its sale from Mr. Hollinger to Mr. Wacker, the land has undergone several subdivisions. In the course of the land development adjacent to the site an easement was agreed upon associated with a septic system and storm drain discharge from the adjacent parcel onto the site.

Based on subsurface data collected at the adjacent site, by the site owners, during a planned expansion of a septic system, it was determined that tetrachloroethylene (PCE) and 1,1,1-trichloroethane were being discharged into the septic system from a dry cleaning operation. According to NJDEP reports, the discharge contained such a low level of PCE at the time that the sampling was conducted, no evidence exists indicating that PCE was present in the septic system and the septic tanks were completely emptied and the discharge now goes to the public sewer system. All effluent from the adjacent site currently, and since 3 February 1993, discharge to the Camden County Municipal Utility Authority.

On 12 November 1997, Sherwin-Williams entered into an AOC with US EPA to conduct a removal action consisting of installation of a site fence, warning signs, site security system, silt fencing and impermeable membrane cover. This work was conducted between October and December 1997.

Currently, the site is vacant commercial property, enclosed by a fence equipped with a surveillance system that runs continuously.

The history of environmental investigations is further discussed in Section 3.0.

2.5 WHITE SAND BRANCH

White Sand Branch is a small stream located in Gibbsboro, Camden County, New Jersey, and flows in a southwesterly direction from Clement Lake, flows through the Rt. 561 Dump Site, bisects Block 23, Lot 1 (United States Avenue Burn site), and connects with Haney Run Brook, which discharges into Bridgewood Lake. The outflow is routed through a culvert under United States Avenue, which restricts and regulates the discharge. Where not disturbed by development, the banks of the stream are wooded and occasionally support wetlands. Gradients are low.

Figure 2-2 depicts the site location and topography.

A map of freshwater wetlands for White Sand Branch and vicinity is presented in Figure 2-7.

Investigations of portions of White Sand Branch have been conducted as part of the United States Avenue Burn site activities, by NJDEP, US EPA and Sherwin-Williams. The history of environmental investigations is further discussed in Section 3.0.

2.6 HANEY RUN BROOK

Haney Run Brook is a small stream located in Gibbsboro, Camden County, New Jersey, and flows in a westerly direction through Block 25, Lot 1, and connects with White Sand Branch and discharges into Bridgewood Lake. The outflow is routed through a culvert, under United States Avenue, that restricts and regulates the discharge. The banks of the stream are wooded and occasionally support wetlands. Gradients are low.

Figure 2-2 depicts the site location and topography.

A map of freshwater wetlands for Haney Run Brook and vicinity is presented in Figure 2-7.

Investigations at Haney Run Brook have been conducted as part of the United States Avenue Burn site activities, by NJDEP, US EPA and Sherwin-Williams. The history of environmental investigations is further discussed in Section 3.0.

2.7 BRIDGEWOOD LAKE

Bridgewood Lake is located on the west side of United States Avenue in Gibbsboro, New Jersey. Bridgewood Lake discharges in a southwesterly direction directly to the main branch of Hilliard Creek. Hilliard Creek eventually discharges into the headwaters of the Cooper River at a point located approximately three-quarters of a mile southwest of the site. An 1898 USGS topographic map does not show Bridgewood Lake (Figure 2-2A). Instead, White Sand Branch and Haney Run Brook converge at a point west of the present United States Avenue. An aerial photograph from 1940 depicts Bridgewood Lake, suggesting that the lake was created during the intervening 42 years (Weston, Feb. 1998).

To the north, the lake is bordered by wooded land owned by Circle-K Sportsmen's Club, by a cemetery, and by a wooded area owned by the cemetery association. The former wastewater treatment lagoons are located north of the cemetery property. To the south, the lake is bordered by the Circle-K Sportsmen's club, which operates a shooting range on that parcel. Some of the target areas are oriented so that the shooting is towards the lake. To the east the lake is bordered by wooded undeveloped land, which includes the easement of the former Lucaston Rail Road (now defunct). To the west, the lake terminates at W. Clementon Road.

The lake is divided into two lobes by a stone causeway that is located at the upstream quarter of the lake. Historical aerial photography suggests that it is the remnant of a dirt road or path that extended from W. Clementon Road to United States Avenue.

Figure 2-2 & Figure 5-7 depict the site location and topography.

A map of freshwater wetlands for Bridgewood Lake and vicinity is presented in Figure 2-7.

Figure 2-8 provides the locations of existing monitoring wells and well points in The Paint Works, Burn Site and Bridgewood Lake areas.

Investigations in Bridgewood Lake were conducted by Sherwin-Williams as part of the investigations of the United States Burn Avenue site. Limited investigations have also been conducted by US EPA, as part of the Hilliard Creek activities. The history of environmental investigations is further discussed in Section 3.0.

2.8 HILLIARD CREEK

Hilliard Creek originates at Silver Lake and flows through The Paint Works in a southwesterly direction, then turns west under W. Clementon Road, receives the outflow of Bridgewood Lake and continues in a westerly direction to Kirkwood Lake. Approximately 1000 feet upstream from Kirkwood Lake it receives the water of Nichols Creek and just before it enters Kirkwood Lake it merges with the Cooper River. Figure 2-2 depicts the site location. A map of freshwater wetlands for Hilliard Creek and vicinity is presented in Figure 2-7.

Hilliard Creek and the Cooper River are within the boundaries of the Delaware River Watershed. Hilliard Creek receives its waters from groundwater seepage and from Clement, Bridgewood and Silver Lakes located directly east of Clementon Road. The stream also is fed through a system of catch basins, storm sewers, and culverts from the southern edge of Silver Lake to the southern edge of Foster Avenue. The site is subject to periodic flooding.

Historical aerial photography indicates that, west of W. Clementon Road, land use along the course of Hilliard Creek has changed over time. Historically, properties along that portion of the

creek were used for farming, but were gradually abandoned and either subdivided for residential development or were acquired by the Borough of Gibbsboro under the Green Acres program. To the East of W. Clementon Road, Hilliard Creek is bordered by the cemetery, The Paint Works and residential properties.

There is limited information available concerning disposal practices at the Hilliard Creek site. However, based on a review of available site maps and a review of contaminant distributions in and around Hilliard Creek, it is possible that the manufacturing operations in the vicinity of the creek may have impacted the creek. Specifically, a review of the available information indicates the following:

- A 1964 insurance map of the former Lucas/Sherwin-Williams manufacturing facility labels Hilliard Creek a drainage ditch located between above-ground storage tanks (ASTs) (also referenced as former Tank Farm B in Figure 2-3) and a garage (also referenced as building 50 in Figure 2-4 and the current police station in Figure 2-3) with a gasoline storage tank and pump. The ASTs were shown as being surrounded by a 2 to 3 foot high earthen dike. This map also shows that Bldg. No. 67 (also referenced as the former Academy Paints building in portions of this RI/FS Work Plan and in Figure 2-3) located east of Hilliard Creek was used as a warehouse, with a railroad and tanker truck solvent unloading station at its northern side and a sewage treatment plant and drum storage area to its southern side. This same map also shows Sherwin-Williams' former wastewater lagoon located directly south of Bldg. No 67 and east of Hilliard Creek.
- The 1947 site map indicates drainage from the aboveground solvent storage tanks (former Tank Farm B) flowing in an eastern direction into Hilliard Creek. The map states that the ground slopes to a small brook. Additionally, this map indicates that a flood in September 1940 broke a dam wall and caused water to enter parts of the building to a depth of 4 to 5 feet. It is not stated which buildings were affected, or whether raw materials or finished product were discharged.

Between 1992 and 1999, Sherwin-Williams conducted sampling at Hilliard Creek, east of W. Clementon Road, under NJDEP oversight, as part of the Paint Works investigations. In 1998 and 1999, US EPA collected soil and sediment samples along Hilliard Creek, east of Hilliard Road. Sherwin-Williams entered an AOC for Removal Action with US EPA, in September 1999, to address Hilliard Creek west of W. Clementon Road. Activities conducted under this AOC include an extensive sampling and analysis program and installation of access control measures. A report will be submitted to the US EPA Removal Branch upon completion of these activities. Remaining activities include additional sampling, and treatability evaluations. Data collected up to April 2000 is included in this Work Plan, in Section 3.0.

2.9 RAILROAD TRACK SITE

The Railroad Track site is a rail siding located in Gibbsboro, Camden County, New Jersey (Figure 2-2). The site is bordered by United States Avenue to the east and by a wooded area and Bridgewood Lake to the west. The railroad track extends through the center of the site in a north-south direction. The railroad right-of-way is approximately 40 feet in width and extends from The Paint Works Corporate Center property to Conrail tracks located approximately 2 miles to the south. The tracks parallel United States Avenue over the 2-mile stretch between the Borough of Gibbsboro and the town of Lindenwold, New Jersey. The site is located in and around Block 19.02, Lot 1. Sherwin-Williams recently donated the land to the Borough of Gibbsboro, for the construction of a bike-path.

The railroad bed is elevated approximately 2 to 6 feet above the surrounding grade in most areas. The site included an area of discolored soils, which measures approximately 60 feet wide by 400 feet long and encompasses approximately 24,000 square feet. The site cover consists of sand, gravel, railroad tracks, railroad ballast, ash and cinders, and sparse to dense vegetation (e.g., weeds). Groundwater occurs between 2 and 8 feet below grade. Within the immediate vicinity of the site, the land is lightly to densely wooded, with thick underbrush (Weston, Jan. 1999).

Based on historical research performed by William Bolger (1982), “the railroad tracks were first constructed in the mid 1880s with the completion of a private rail spur”. The main purpose of this railroad spur was to connect The Paint Works with the Camden and Atlantic Railroad, passing 2 miles south of The Paint Works (Bolger, 1982). The railroad was completed and fully operational on 10 October 1887. The railroad was operated for the purpose of carrying passengers and shipping raw materials to and finished goods from the former Lucas Paint Company (Bolger, 1982). The railroad tracks were utilized until operations at the Paint Works were terminated.

Based upon information available to Sherwin-Williams, the rail track portion of the Site previously was used as a railroad line to transport raw materials to the manufacturing facility and finished goods from the manufacturing facility. It is also believed that during some timeframe, the rail line was used to transport passengers as well. Sherwin-Williams is not aware of the rail track portion of the Site ever being used for disposal of any materials. It is believed that there may have been spills of raw materials, from time-to-time. However, Sherwin-Williams is not aware of any records relating to such spills. Furthermore, Sherwin-Williams is not aware of any information related to alleged back-filling activities conducted by Lucas/Sherwin-Williams along the railroad bed.

On 1 May 1997 US EPA’s Removal Branch issued a Unilateral Administrative Order for Removal Response Activities. Under this Order, Sherwin-Williams removed and disposed 1,960 tons of soils/debris, 2,738 gallons of non-hazardous liquids, and 1,850 gallons of hazardous liquids. A total of 197 samples were collected by Weston for analysis to confirm that the contaminated soils had been removed. This work was performed under US EPA Removal Branch oversight.

In 1999 US EPA listed the United States Avenue Burn Site on the National Priorities List (NPL). Sherwin-Williams filed a petition with the United States Court of Appeals for the District of Columbia Circuit (No. 99-1388), appealing the listing of the United States Avenue Burn Site. This appeal also includes the Railroad Area, which was listed as part of the United States Avenue Burn Site. Sherwin-Williams, the Department of Justice (DOJ) and US EPA negotiated a settlement and US EPA published a Federal Register notice on August 30, 2002, which clarified that the United States Avenue Burn site, as listed on the NPL, does not include the Railroad Track Area. However, the Railroad Track Area will continue to be investigated as part of the RI/FS pursuant to the September 30, 1999 RI/FS AOC signed between US EPA and Sherwin-Williams.

SECTION 3.0

INITIAL EVALUATION OF EXISTING DATA

3.1 REGIONAL SETTING

3.1.1 Regional Geology and Hydrogeology

The United States Avenue Burn Site, Route 561 Dump Site, Railroad Track Site, Hilliard Creek, White Sand Branch, Bridgewood Lake, Haney Run Brook, Silver Lake and Kirkwood Lake are situated within the Atlantic Coastal Plain Physiographic Formation Province. The Coastal Plain geology within Camden County is characterized by unconsolidated and semi-consolidated sediments of Cretaceous through Quaternary Ages consisting of alternating sands, silts, and clays. The sediments dip gently to the southeast and thicken from approximately 40 feet at the Delaware River to over 2,900 feet at the Camden-Atlantic County boundary. Below these unconsolidated sediments is pre-Cretaceous-Age crystalline bedrock.

The sites are underlain by Pleistocene Age sands of the Pennsauken Formation. The Pennsauken Formation outcrops in irregular patches in the Gibbsboro area and ranges in thickness from a few feet to approximately 30 feet. The Pennsauken Formation consists of medium to coarse-grained quartzose sand, gravel, and clay.

The Pennsauken Formation is commonly underlain unconformably by the Kirkwood Formation, which consists of sand, silt, and clay. The lower part of the Kirkwood Formation is mostly thick-bedded, very fine to fine-grained sand, is typically micaceous, and has dark-colored diatomaceous clay. The basal 2 to 4 feet consists of poor to moderately sorted pebbly, coarse sand with abundant glauconite. The upper part of the formation is an interbedded poorly sorted silt and clay. This formation dips 15 to 25 feet per mile to the southeast and ranges in thickness from 57 feet in Voorhees Township to 96 feet in Gloucester Township. The Kirkwood Formation is believed to have a thickness of approximately 80 feet in the vicinity of the sites (Figure 3-1).

The Manasquan and Vincentown Formations underlie the Kirkwood Formation. It is difficult to differentiate between these two units using hand samples in the field. The total thickness of these two units in Camden County ranges from 1 to 210 feet. The Manasquan Formation overlies the Vincentown Formation and has been described as clayey, quartz-rich, fine-grained, glauconite sand. The underlying Vincentown Formation consists mainly of light brown to light gray, very fine, calcareous, micaceous sand. This formation has two recognizable facies: a quartzose sand with glauconite and a limey or marly sandstone, which contains fossil shells.

The major freshwater aquifers in Camden County are sands and gravels of the formations of the Cretaceous and Tertiary Ages. The Potomac Group and the Raritan and Magothy Formations form the principal aquifers in the northwestern portion of Camden County. The Cohansey Sand is a

regional "blanket sand" forming the major aquifer for the Pine Barrens in the southeastern portion of the county; and the Wenonah-Mount Laurel aquifer, consisting of the Wenonah Formation, the Mount Laurel Sand, and the Englishtown Formation form the third tier of aquifers in Camden County. The Pennsauken, Kirkwood, Manasquan, and Vincentown Formations are not typically utilized for potable water supply in Camden County (USGS, 1976), although each of those units could yield water of potable quality to domestic wells, and these units are designated as potential potable water sources by the NJDEP.

The Kirkwood-Cohansey aquifer system is predominantly a water-table aquifer that underlies the updip limit of the outcrop of the Kirkwood Formation. This aquifer system is composed of the Kirkwood Formation and the Cohansey Sand. The Cohansey Sand, a Miocene age deposit, is coarser grained than the underlying Kirkwood Formation. It is predominantly a light-colored quartz sand containing minor amounts of pebbly sand, fine- to coarse-grained sand, silty and clayey sand, and interbedded clay. Some local clay beds within the Cohansey are relatively thick. Locally, perched water tables and semi-confined conditions can exist in the Kirkwood-Cohansey aquifer system. The basal surface of the Kirkwood-Cohansey aquifer system is the top of the clay bed lying within the lower part of the Kirkwood Formation. This clay bed is the updip extension of the confining bed underlying the 800-foot Sand of the Atlantic Formation and is probably the equivalent of the Alloway Clay Member of the Kirkwood Formation (Nemickas and Carswell, 1976). A water well survey confirmed that the Pennsauken and Kirkwood Formations, which underlie the sites, are not utilized for municipal or domestic water supply within a minimum of 1 mile of the study area. However, these formations are designated by the NJDEP as potential potable water sources.

The sands of the Pennsauken Formation and the upper section of the Kirkwood Formation form the shallow subsurface in the area of the United States Avenue Burn site. These formations are approximately 20 to 30 feet thick in the study area, are generally hydraulically connected, and form an unconfined (water table) aquifer. The Vincentown and Manasquan Formations underlie the Kirkwood Formation and function as confining layers between the Kirkwood Formation and the Wenonah-Mount Laurel aquifer (USGS, 1976). These two formations are similar to the Pennsauken and Kirkwood Formations in that they are generally not widely utilized for potable water supply. The USGS regards the Vincentown Formation as a relatively minor source of potable water supply in the area with wells producing approximately 10 gallons per minute (gpm). While the Pennsauken, Kirkwood, Manasquan and Vincentown Formations are designated as potential potable water sources by the NJDEP, the fact that the Borough of Gibbsboro is served by the New Jersey American Water Company municipal water supply (though some residents still use private wells for potable water supply, see Table 3-1 and Figure 3-3) indicates that any major future pumping would likely be restricted to the Cohansey Sand, thereby limiting the potential influence the site could have on off-site water supply resources.

3.1.2 Population and Environmental Resources

The Borough of Gibbsboro has a relatively low-density population located in a suburban setting. The population of Gibbsboro according to 1990 Census data is 2,380, while the population of Camden County was listed at 502,824 people in 1990. According to a population demographics based upon the 1990 Census data prepared by the (ATSDR) using area-proportion spatial analysis: within a one mile radius of the U.S. Avenue Burn Site there are approximately 1,406 housing units with an estimated population of 4,465 people, 472 children aged 6 and younger, 379 adults aged 65 and older, and 1064 females aged 15-44; and, within a one mile radius of the Route 561 Dump Site there are approximately 1592 housing units, an estimated population of 5280, 565 children aged 6 and younger, 387 adults aged 65 and older, and 1250 females aged 15-44. 1990 Census data for the surrounding communities of Clementon, Lindenwold and Voorhees show a population of 5,601, 18,734 and 24,559, respectively.

Approximately 0.2 mile west of The Paint Works, along Kirkwood Road, are located a public school, library and municipal offices. Eastern High School is located just inside the one-mile radius to the northwest of The Paint Works (Figure 3-4). There are at least two homes approximately 200 feet near the Route 561 Dump Site and at least one of these homes draws potable water from a residential well (Figure 3-3 and Table 3-1). There is at least one home, which is within 200 feet from the United States Avenue Burn Site that draws potable water from a residential well (Figure 3-3 and Table 3-1).

As outlined in previous sections, there are several lakes and streams within the area of the sites. None of these have been developed for direct recreational use, but do provide indirect recreational value. Silver Lake is surrounded by a pedestrian walk (but swimming and boating are prohibited by the Borough) and a shooting range is located on the southern shore of Bridgewood Lake. Several residential properties border Hilliard Creek, along its western bank. Kirkwood Lake (located approximately 1.25 miles downstream of The Paint Works and the Gibbsboro Nature Preserve) supports some recreational activities.

The Gibbsboro Nature Preserve is located a short distance southwest of the site. It includes walking trails for area residents. Hilliard Creek flows through the Preserve.

Environmental resources located within the area encompassing the Sherwin-Williams sites include groundwater, surface water, and wetlands. The sites are located within the Cooper River Watershed, which covers an area of approximately 40 square miles. Headwaters of the Cooper River originate approximately 0.7 mile south of Block 23, Lot 1 (United States Avenue Burn site). The surface waters of the Cooper River are designated as FW-2. All of the surface water bodies within the site eventually discharge into the Cooper River. Flow in the river is northwest through the city of Camden to the Delaware River. Surface water quality is generally good in the upper reaches of the Cooper River, but degrades rapidly as the river flows through the city of Camden (Weston, Nov. 1995).

3.1.3 Water Well Survey

Weston reviewed NJDEP, Bureau of Water Allocation well records to identify existing wells outside the site. The well survey searched for all wells, and the geologic formation in which they were finished. The water well survey concluded that the Cohansey, Pennsauken and Kirkwood Formations, which underlie the RI/FS study area, are not utilized for municipal or domestic water supply within a minimum of 1 mile of The Paint Works area, which is the approximate geographic center of the sites. The Pennsauken Formation and the Kirkwood Formation, which also underlie the sites, are not generally utilized for potable water supply in this area of Camden County (USGS, 1976). The well survey did not identify any public supply wells screened in the Manasquan and Vincentown Formations and the Cohansey Formation in the area of the sites. However, the Pennsauken, Kirkwood, Manasquan, and Vincentown Formations are designated by the NJDEP as potential potable water sources.

The entire Borough of Gibbsboro is serviced by the New Jersey American Water Company. The public water supply wells nearest the U.S. Avenue Burn and Hilliard's Creek Sites are located approximately one mile west/southwest and 1000 feet south, respectively, from the sites. The public supply wells nearest the Route 561 Dump Site are approximately 1.25 miles southeast and approximately 1.3 miles southwest of the site. Some of these wells are screened in either the Lower Potomac-Raritan-Magothy aquifer system at depths of over 450 feet below ground surface (BGS) and some in the Mount Laurel-Wenonah system, at somewhat shallower depths, approximately 260 feet (Figure 3-2). During the Paint Works NJDEP investigations, Sherwin-Williams identified some domestic supply wells in the residential area along Clementon-Gibbsboro Road (Weston, Feb. 1998).

In October 1996, Weston obtained a copy of the tax map for Gibbsboro, Camden County, New Jersey. The map was used as a basis to mail (on 29 October 1996) Well Survey Questionnaires to 20 residents along United States Avenue and Marlton Avenue (Weston, Feb. 1998).

Those residents who did not respond to the survey were contacted by telephone on 25 and 26 November 1996. Those who could not be reached were mailed a certified letter (29 November 1996) requesting a response to the survey. On 8 January 1997, a questionnaire was sent to those residents who had not responded at that juncture. The residents were also offered the option of calling collect to provide their answers. In addition, on 31 January 1997, Weston personnel attempted to visit individual residences to obtain the necessary information (Weston, Feb. 1998).

The results of the residential well survey for the above-referenced domestic supply wells are summarized in Table 3-1. In 1993 Weston conducted a search of the NJDEP Bureau of Water Allocation well records database to identify existing wells. Those wells denoted as domestic wells have been included in Table 3-1 and Figure 3-3. Also included in Table 3-1 are the residence address, total well depth, pump depth and approximate usage volumes, when available. The location of all the private wells with their respective address is provided as Figure 3-3.

One residential potable well was identified at 25 United States Avenue, north of the United States Avenue Burn Site. The construction details of the well are not known, and the completion of the well does not allow access to sound the total depth. Testing of the well by NJDEP in 1994 found the well suitable for potable purposes (Weston, Feb. 1998).

In the course of the 1999/2000 investigations conducted at Hilliard Creek under the oversight of US EPA's Removal Branch, a residential well was identified and sampled at 101 McIntire Lane. A sample was collected on 5/16/2000 and analyzed for Priority Pollutant metals. None of the analytes were detected.

3.1.4 Land Use

The population of Gibbsboro according to 1990 Census data is 2,380, while the population of Camden County was listed at 502,824 people in 1990. According to a population demographics based upon the 1990 Census data prepared by the (ATSDR) using area-proportion spatial analysis: within a one mile radius of the U.S. Avenue Burn Site there are approximately 1,406 housing units with an estimated population of 4,465 people; and, within a one mile radius of the Route 561 Dump Site there are approximately 1592 housing units and an estimated population of 5280. 1990 Census data for the surrounding communities of Clementon, Lindenwold and Voorhees list a population of 5,601, 18,734 and 24,559, respectively.

For ease of reference, this discussion utilizes The Paint Works as the center-point, since The Paint Works is located in the approximate center of the area under investigation. The Paint Works is made up of nine buildings, two of which, 1 and 7 Foster Ave., are currently vacant. According to Brandywine, 1,200 people are currently employed at the site with the greatest number historically being 1,400. Occupancy figures for the time period when Sherwin-Williams and Lucas occupied the site are not available.

The Paint Works is zoned "OTP" (Office Technical Park). Properties immediately to the east and south are zoned "OR" (Office Residential). Beyond these properties, the zoning changes to residential of varying density. Immediately to the north the properties are zoned "C2" (Highway Business District) with residential of varying density further to the north. Following Route 561 to the west, land use is "M1" (Industrial), "C2" and "OTP". Directly west of the site, land use is residential of varying density, except for the area between Haddon Ave and Route 561 that is zoned "OR". A copy of the Gibbsboro Zoning Map is provided in Appendix B. There is no active development in the lots adjacent to The Paint Works. Generally, development in the Borough is limited.

The Voorhees Township Zoning Map indicates that the land use adjacent to Hilliard Creek is MDR (Medium Density Residential). A copy of the Voorhees Township Zoning Map is

provided in Appendix B. Other uses, within 1 mile from the Hilliard Creek site include (in order of increasing distance):

DESIGNATION	USE/TYPE
ORB	Office, Retail, Business
CP	Community Property
01	Office
03 (TC-1)	Office (Township Center)
03	Office
TC	Township Center
B	Business
SH	Senior Housing
EIB (EE)	Economic Industrial Business
EIB (CCRC)	Economic Industrial Business
MDR (R100A)	Medium Density Residential
RR	Rural Residential. Residential Office
B	Business

The Lindenwold Zoning Map indicates that the land use in the areas closest to Hilliard Creek is R-2 (Single Family Detached Residential). A copy of the Lindenwold Zoning Map is provided in Appendix B. Other uses, within 1 mile from the Hilliard Creek site include (in order of increasing distance):

DESIGNATION	USE/TYPE
R-2	Single Family Detached Residential
R-3	Single Family Detached Residential
B-1	Neighborhood Business
I-1	Light Industrial
OP-1	Office and Professional
B-2	Highway Business
R-4	Multi-Family Residential
R-1	Single Family Detached Residential

Figure 3-4 presents the land use classification, based on data from the NJDEP GIS. This map presents actual land use, as interpreted from aerial photographs. Within one mile of the Paint Works, land use includes woodlands, and industrial, commercial, and residential developments. The area south of the site between United States Avenue and Haddonfield Avenue is primarily woodland. The woodlands extend west along Hilliard Creek and to the north beyond Route 561. Woodlands along Hilliard Creek, between Gibbsboro-Clementon Road and Hilliard Road belong the Gibbsboro Nature Preserve. The remaining area is primarily residential, with commercial and industrial activities concentrated along the main thoroughfares. The area west of Nicholson

Branch is mapped as recreational. North of the Borough's corporate boundary, on either side of Gibbsboro Road, land use is mapped as barren land.

Approximately 0.2 mile west of The Paint Works, along Kirkwood Road, are located a public school, library and municipal offices. Eastern High School is located just inside the one-mile radius to the north west of the site.

Several commercial and industrial operations are present in the immediate vicinity of The Paint Works. A former gasoline service station, previously leased to CITGO and the Sun Oil Company, was located directly northeast of the intersection of Foster Avenue and United States Avenue. This building is now abandoned. Two USTs of unknown capacity are located at the site.

The former GE Co. Aerospace Government Electronic Systems facility is located immediately to the north of the facility, at the intersection of Route 561 and United States Avenue. When it was in operation, the facility was listed on the Toxic Release Inventory (TRI) as releasing to the air and disposing of 1,1,1-trichloroethane.

A number of Resource Conservation and Recovery Act (RCRA)-notifier facilities (most of them federal large-quantity generators) are listed in the Borough of Gibbsboro (Table 3-2). At least two of those are former tenants of The Paint Works (Academy Paints and Scotko Sign & Display Company are also referenced as former buildings 67 and 58 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4).

3.1.5 SOILS

According to the USDA Camden County, New Jersey soil survey, the following soil types are present in the study area. A soil type map is presented in Figure 3-5.

Lakehurst Series

The Lakehurst Series consists of moderately well-drained to somewhat poorly drained coarse-textured sand. These soils occur in depressed areas in intermediate positions where slopes are low. The Lakehurst soils are distinguished by mottles and a strongly bleached horizon 6 or more inches thick. These soils are rapidly permeable and have low natural fertility. A typical profile consists of an 11-inch-thick surficial layer composed of gray sand. The subsurface includes 2 inches of brown sand or loamy sand and 17 inches of yellowish-brown sand containing a few faint mottles. The substratum consists of 30 inches of pale brown sand containing a few medium mottles.

Lakewood Series

The Lakewood Series is a group of predominantly sandy soils, which are deep, loose, and excessively drained. Lakewood soils have a bleached horizon 7 or more inches thick. This soil type is limited to slopes of 0 to 5%. Lakewood soils have rapid or moderately rapid permeability and low or very low available water capacity. Runoff occurs only during the most intense rainfall events. Lakewood soils are low in organic matter content and fertility. Fertilizers added to Lakewood soils leach readily. These soils are very acidic. A typical profile includes an upper surface layer of gray sand approximately 10 inches thick. The subsoil consists of sand that extends to a depth of approximately 20 inches and is strong brown in the upper 4 inches and brownish yellow below. The substratum is light yellowish-brown sand.

Lakehurst-Lakewood Association

This unit contains areas of both Lakehurst sand and Lakewood sand so intricately mixed that they cannot be mapped separately at the scale used. The Lakehurst soils are dominant in the complex. Lakewood soils occur in the higher positions. Neither soil, however, is suitable for crops. The nearness of the water table to the surface is reflected in the more rapid growth of pine trees on the Lakehurst soils. When this unit is used for building sites, the seasonally high water table in the Lakehurst soil may cause basement seepage and problems in septic fields.

Leon Sand

A profile of this soil is described as typical of the Leon series. Small areas of loamy sand and fine sand are included with this soil in mapping. Lenses of clay or sandy clay occur in some areas between a depth of 30 and 60 inches, but these areas were not extensive enough to be mapped separately. In places the light-gray subsurface layer is thicker than the darker surface layer. In these places the soil is less suitable for crops. In areas where a hardpan is continuous, the soil is less permeable. This soil provides good sites for dugout ponds. In areas that have underlying clayey layers, however, the rate of recharge is slower than is normal for Leon soils.

Loamy Alluvial Land

This land type is composed mostly of fine sandy loam, sandy loam, or loam soil material deposited recently by floodwater. It is in nearly level areas beside meandering perennial streams. Generally, slopes range from 1/2 to 1 percent. Microrelief, or small knolls and depressions, however, occur within these nearly level areas. The knolls are generally sandy. Generally, the texture of Loamy Alluvial Land is similar to that of the surrounding soils. A clayey subsoil has not had time to develop. In the greensand area, the soil material contains various amounts of glauconite. In places olive-colored, glauconitic layers underlie the sandy deposits. Deposits of gravel and coarse sand occur in places.

Made Land

This mapping unit consists of areas where the soil material has been so mixed by excavation, filling, or other disturbances that the original soil horizons have been destroyed. In sanitary landfills, for example, much foreign material was mixed with the soil before it was graded.

In most places in Camden County, the soil material near the surface of Made land is predominantly sand and gravel, but in a few places there is much fine material, especially in the Howell-Urban land soil association. In some places this land type is underlain by clayey layers. Along the Delaware River and other major streams, the material making up Made Land came from pumping operations done to deepen stream channels. These areas contain boulders in addition to sand and gravel. Many recent residential and commercial building sites are in this mapping unit. Also, along the Cooper River this land has been developed as part of the Camden County system of parks.

Pasquotank Fine Sandy Loam

This poorly drained soil has moderately slow permeability. Tile drains generally need to be supplemented by bedding, willow ditches, or land smoothing to provide adequate drainage. Ditch banks slough severely when the soil is saturated. Special precautions must be taken to prevent the fine material from clogging tile lines. Included in areas mapped as this soil are small areas of Barclay, Nixonton, and Weeksville soils. This soil warms slowly in spring. It occurs in natural frost pockets.

Pasquotank And Weeksville-Urban Land Complex

This mapping unit consists mostly of Pasquotank soils and some areas of Weeksville soils that are used for urban and suburban purposes. Construction has caused considerable mixing of the soil material. Areas in urban use have generally been drained, and some low areas have been filled with soil material. A special investigation of each site in this mapping unit is needed to determine its suitability for a specified use and to determine how much the soil at the site has been altered.

Westphalia And Nixonton-Urban Land Complex

Westphalia soils make up most of this mapping unit, but Nixonton soils are in lower positions. Slopes are generally less than 5 percent. The Nixonton soils have a high water table in winter. Where urban development has been extensive, there has been much disturbance of the soil during construction. Leveling operations, deep cuts, and fills have changed the soil layers considerably. Where individual buildings have been built, there has been less disturbance. Permeability of the subsoil is moderately slow, but in the substratum it is moderate or rapid. Because the soil material has uniform texture, it collapses easily if trenched when it is saturated.

3.2 HISTORY OF INVESTIGATIONS

Some of the investigations summarized below were initiated in conjunction with the former Sherwin-Williams manufacturing site, which is currently utilized as an office and light industrial complex (The Paint Works). Investigations at the former manufacturing site were conducted under an Administrative Consent Order (ACO) with the NJDEP, which was terminated in July 2001. While reference to The Paint Works is made in subsequent sections, The Paint Works site is not covered by the AOC and is not a subject of this Work Plan.

3.2.1 United States Avenue Burn Site

A brief discussion of the previous investigations is presented below. Information has largely been excerpted from reports previously submitted to US EPA or NJDEP, with little or no editing.

3.2.1.1 Soil Sampling

In 1976, NJDEP directed Sherwin-Williams to conduct a subsurface investigation in the Former Landfill Area of the United States Avenue Burn site (Block 25, Lot 1). Sippel and Masteller Associates, Inc. and Alfred McClymont, P.E. conducted the investigation on behalf of Sherwin-Williams. The investigation characterized topographic features, subsurface conditions, and volumes of foreign materials. Thirty soil borings were drilled within the Former Landfill Area. Municipal waste, consisting of household waste, commercial wastes, construction debris, and discarded automobile parts were encountered in the soil borings throughout this area. The layers of municipal waste ranged in thickness from 2 to 10 feet. Sludge was encountered at thicknesses of up to 5 feet in the soil borings completed within the three pits.

NJDEP issued an Administrative Order (AO) to Sherwin-Williams on 17 August 1978. The AO required Sherwin-Williams to remove all sludges and contaminated soil (but not the municipal waste) from the sludge pit area within the Former Landfill Area by 1 January 1979. As noted above under Section 2.3, sludges from Sherwin-Williams' on-site lagoons that received latex/water-based paint waste and sewage waste were dredged out of the lagoons on an annual or bi-annual basis and disposed of at the U.S. Avenue Burn Site. Sherwin-Williams constructed

bermed storage areas within what is now referred to as the Former Landfill Area to store the wastewater sludge and used the bermed areas between 1950 and 1977. Closure of the Former Landfill Area was performed by SCA Chemical Services between October and December 1979. McClymont Associates provided engineering support. A total of 557 cubic yards of sludge material was removed from the Former Landfill Area. Removal activities were performed under the direction and oversight of NJDEP. NJDEP approved the closure activities on 19 May 1981.

Weston investigated the Former Landfill Area as part of The Paint Works Corporate Center Phase I RI between August 1991 and January 1992. This area was identified as Area of Environmental Concern V (AEC V). Nine soil borings were drilled in the Former Landfill Area (Block 25, Lot 1); three soil borings were located within each of the three former pit areas. The borings were completed to visually characterize subsurface conditions in the Former Landfill Area, and specifically to confirm that a removal action performed in 1979 resulted in the removal of all sludge material. Although trace amounts of sludge were observed, the investigation confirmed that the 1979 removal action had indeed successfully removed all sludge. The purpose of the 1979 removal action was to limit the existing public health hazards and environmental impacts of the site and to take additional temporary measures to reduce migration of contaminants and the associated risk. While contaminants are still present at the site at levels above the NJDEP Soil Cleanup Criteria (SCC), the removal action was successful in achieving the goals stated in the AOC for the site. Paint chips were observed in only two soil borings and colored staining was observed in only one soil boring. Municipal waste including glass, wood, and copper was observed in the five soil borings. Fill material was observed in all of the soil borings.

NJDEP conducted an inspection of Block 23, Lot 1 (which was not included in the ACO with the NJDEP) on 8 February 1993. NJDEP reported observing a 60-foot by 60-foot area containing visible burnt waste along the northern bank of White Sand Branch. NJDEP also reported that wastes in the form of paint cans were retrieved from within White Sand Branch. The NJDEP also reported an area along White Sand Branch where petroleum-like odors were detected in the soils. Based on this information, NJDEP issued a Directive to Sherwin-Williams regarding Block 23, Lot 1. In response to the NJDEP Directive, Sherwin-Williams constructed a chain-link fence around the portion of Block 23, Lot 1 that NJDEP considered to be an immediate environmental concern (IEC) in July 1995. This included the area containing visible burnt waste.

Between June 1993 and October 1993, Weston conducted a Phase II RI of The Paint Works Corporate Center on behalf of Sherwin-Williams. As part of the Phase II RI, the Former Landfill Area and portions of Haney Run Brook were investigated further. This work was conducted under an ACO with NJDEP.

Activities at the Former Landfill Area included the installation of nine soil borings (TB-19 through TB-27) to determine soil conditions and provide stratigraphic information, and two rounds of groundwater sampling were conducted. Groundwater samples were collected from four monitoring

wells during each round. Analysis of groundwater samples included PP VOA+15, PP BNA, lead, chromium, barium and phenols.

Soil borings installed in the pit areas extended to the fill/native soil interface at a minimum of 16 feet in depth. Split-spoon samples were collected continuously in each boring and were screened with air monitoring instruments immediately following collection. Split-spoon samples were described by a qualified Weston geologist or soil scientist.

Three soil borings (TB-25, TB-26 and TB-27) were installed in the area corresponding to the former northwest disposal pit. Fill material extended from the ground surface to 12 to 15 feet BGS in the borings. Paint chips were noted in TB-26 from 8 to 10 feet BGS. Paint chips and paint residues were noted in TB-27 from the depths of 2 to 4 feet BGS and 6 to 8 feet BGS. Municipal waste (glass, wood) was noted in two borings at the depth of 10 to 12 feet BGS. Air monitoring instrument response was noted when screening samples collected from depths of 2 to 16 feet BGS. Intensity of response ranged from 10 to 200 units. Samples collected from 2 to 16 feet BGS also exhibited a petroleum like hydrocarbon odor.

Three borings (TB-22, TB-23 and TB-24) were installed in the area corresponding to the former northeast disposal pit. Fill material extended from the ground surface to 10 to 14 feet BGS in these borings. Municipal waste (glass, wood, copper wire) was noted at varying depths within these borings ranging from 2 to 10 feet BGS. Air monitoring instrument response was noted when screening samples collected from depths of 4 to 16 feet BGS. Intensity of response ranged from 5 to 100 units, with the exception of the interval 4 to 14 feet BGS in TB-23, which ranged from 1,000 to 1,500 units. A petroleum-like hydrocarbon odor was associated with all samples.

Three soil borings (TB-19, TB-20, and TB-21) were established in the area corresponding to the former south pit. Fill material extended from the ground surface to 8 to 10 feet BGS in these borings. Paint staining was noted in TB-20 in the split-spoon sample collected from 0 to 2 feet BGS. A monitoring instrument response of 1,000 units was noted in TB-19 from 3 to 4 feet BGS. An odor was also noted in samples collected from this boring from 2 to 8 feet BGS.

The removal of sludge material in the landfill area by Sherwin-Williams in 1979 was confirmed by the split-spoon samples collected. Evidence of paint sludge was not noted with the exception of paint chips intermixed within soils in borings TB-26 and TB-27. Evidence of municipal waste was prevalent, as well as HNu responses and petroleum-like hydrocarbon odors.

One soil sample (034-B001) from soil boring TB-34 was selected for Phase II RI chemical analysis. This location was selected to confirm observations made during the Phase I soil-boring program. The area of TB-34 was the only area identified as a potential concern. The results from these analyses are presented in Table 3-3. Table 3-3 shows that several target VOCs were detected at low concentrations, but none were detected at concentrations, which exceeded the NJDEP impact to groundwater SCC. Several Target SVOCs were detected, but all

concentrations detected were below the NJDEP SCC. VOC TICs and SVOC TICs were identified at estimated concentrations of 4,400 ug/kg and 10,000 ug/kg, respectively. Several metals were detected in the soil sample collected from TB-34. Barium, cadmium, lead, and zinc were detected above soil cleanup criteria at concentrations of 2,040 mg/kg, 6.5 mg/kg, 2,630 mg/kg, and 6,560 mg/kg; respectively.

NJDEP conducted a Site Investigation (SI) in this area on 20 May 1994. Samples were collected from 5 areas of concern (AOCs) as following:

Three waste samples (W-1, W-2 and W-3) were collected from the area exhibiting visible burnt waste (now fenced portion of Block 23, Lot 1), also referred to in the NJDEP SI as AOC No. 1. Antimony (W-2: 41.9 mg/kg; W-3: 31.5 mg/kg), arsenic (W-1: 32.5 mg/kg; W-2: 105 mg/kg; W-3: 43.7 mg/kg), cadmium (W-1: 79.1 mg/kg; W-2: 607 mg/kg; W-3: 517 mg/kg), lead (W-1: 8,140 mg/kg; W-2: 134,000 mg/kg; W-3: 61,200 mg/kg) and copper (W-2: 868) zinc (W-1: 56,000 mg/kg; W-2: 989,00 mg/kg; W-3: 120,000 mg/kg) were detected in concentrations above NJDEP RDCSCC. Of the VOCs only 2-butanone and acetone were detected in W-2 at concentrations well below the NJDEP RDCSCC. SVOCs were not detected above NJDEP RDCSCC. Various tentatively identified compounds (TICs) were detected but were mostly listed as 'unknown'. However, many of the TICs for which a name was provided are fatty acids. 4,4'-DDD, 4,4'-DDE, 4,4'-DDT and aldrin were detected in W-1, in sub-ppm concentrations, well below the NJDEP RDCSCC. PCBs were not detected.

Two soil samples (S-1 and S-2) were collected north of the burnt waste area (AOC No. 2), where petroleum-like odors had reportedly been detected. Most of the VOC, SVOC and metals were not detected, or were detected in concentrations below the NJDEP RDCSCC. Various VOC and SVOC TICs were detected. The majority of those were either unknown hydrocarbons, unknowns or substituted benzenes. Pesticides and PCBs were not detected.

Three waste samples (W-4, W-5 and W-6) were collected from an area located north of the Former Landfill Area, near Haney Run Brook in Block 25, Lot 1, (AOC No. 3). Antimony (W-4: 31.7 mg/kg; W-6: 17.2B mg/kg), lead (W-4: 2,510 mg/kg; W-6: 862 mg/kg) and zinc (W-4: 4,920 mg/kg) were detected in concentrations above NJDEP RDCSCC. VOCs and SVOCs were not detected in concentrations above NJDEP RDCSCC. 4,4'-DDD, 4,4'-DDE, alpha-chlordane and heptachlor were detected in W-4 and 4,4'-DDD, 4,4'-DDE were detected in W-6, in sub-ppm concentrations, well below the NJDEP RDCSCC. PCBs were not detected.

Six sediment and surface water samples were collected along White Sand Branch and Haney Run Brook.

One groundwater sample was collected from the residential well at 25 United States Avenue.

All samples were collected by NJDEP personnel and were analyzed for the complete TCL/TAL list by Industrial Corrosion Management, Inc. and the results were included in the 1994 NJDEP PA and SI documents.

On 29 September 1995, Sherwin-Williams entered into an AOC with US EPA to conduct a removal action investigation at the United States Avenue Burn site, which included Block 23, Lot 1 and Block 25, Lot 1. To provide information to characterize the wastes on site, and to delineate the horizontal and vertical extent of the waste and associated lead contamination at the site, a total of 595 soil samples, including duplicates and replicates, were collected from 131 locations within the United States Avenue Burn site. The samples were collected over four stages of investigation. Consistent with the approved work plan for the United States Avenue Burn site investigation, developed to achieve the goals stated in the 1995 Removal AOC (i.e., to prevent direct contact risk with lead by restricting access to the site where lead levels exceeded 400ppm), lead was selected as the indicator analyte at the site solely for removal action purposes. All soil samples were submitted for lead analyses to delineate the horizontal and vertical extent of lead contamination on site. Subsequent to the completion of the delineation of the horizontal and vertical extent of wastes at the United States Avenue Burn site, an additional 60 soil samples (including duplicates) were collected and submitted for TAL inorganics, hexavalent chromium and cyanide analyses, and 33 soil samples (including duplicates) were collected and analyzed for TCL VOCs and TCL SVOCs. A minimum of 10% of all soil samples were submitted for TAL inorganics, hexavalent chromium and cyanide analyses; 20% of these samples were collected from the contaminated soil and/or wastes; 20% of the samples were collected beneath the vertical extent of the waste or contamination; and 60% were collected beyond the perimeter of the horizontal extent of the waste or contamination. Five percent of the soil samples were analyzed for TCL VOCs and TCL SVOCs. Additionally, eight soil samples (including one duplicate) were collected and analyzed for TCLP metals plus copper and zinc, and four of these samples (including one duplicate) were also analyzed for TCLP VOCs and TCLP SVOCs.

Discussions of soil contamination have been subdivided into lead, TAL metals, TCL VOC, TCL SVOC, and TCLP VOC, SVOC, and metals analyses. Due to the volume of lead analytical data generated to comply with the US EPA Administrative Order on Consent, the discussion of lead results is provided by block.

Figure 3-6 presents the sampling locations and detections above criteria. Figure 3-7 provides a visualization of the vertical distribution of lead analytical results.

Lead

The following provides a summary of the lead analytical results divided by block (Block 23, 25, and 22).

Block 23

Analytical results of samples indicate that elevated surface and subsurface lead concentrations were detected within the fenced portion of Block 23, Lot 1, with limited contamination to the north and east, and small pockets of contamination south of White Sand Branch and Haney Run Brook. With few exceptions, lead concentrations in the fenced area exceeded 400 mg/kg at the surface and the subsurface to a depth of 6.0 to 8.0 feet BGS, depending on location. North of the fenced area, lead concentrations were lower than 400 mg/kg. The concentrations in this location were comparable to background conditions. East of the fenced area, some surficial lead concentrations exceeded 400 mg/kg; however, the concentrations of lead generally decreased with depth. South of White Sand Branch and Haney Run Brook, surface lead concentrations were generally lower than 400 mg/kg (with few exceptions, notably at B-3, which had a concentration of 42,200 mg/kg). However, significant lead concentrations (greater than 400 mg/kg) were detected in subsurface soils at depths of 4 to 6.5 feet BGS. A detailed summary of Block 23, Lot 1 lead results by sampling depth interval is provided below.

The highest lead concentrations in surficial soil (0.0 to 0.5 foot BGS) in Block 23 are predominantly limited to the fenced portion of the site and an isolated area near B-3. East of the fenced portion of the site, lead concentrations were delineated to less than 400 mg/kg at B-20, B-111, B-123, B-128, and B-129. North of the fenced portion of Block 23, Lot 1, lead concentrations were delineated to less than 400 mg/kg at B-28, B-33, B-34, B-35, B-36, B-39, B-40, B-41, B-42, and B-43, with the exception of B-45 (1,740 mg/kg) and B-113 (1,280 mg/kg). Surficial lead concentrations within or near the fenced area of burnt waste material range from 2,890 at B-25 and B-31 up to 51,700 mg/kg at B-18. At borings B-16, B-17, B-18, B-22, B-23, B-24, B-25, and B-29, burnt waste, paint can carcasses, debris, metal, and multicolored material were observed. Another area of high lead concentrations was detected near location B-3 (42,200 mg/kg), where US EPA required that the soil sampling location be biased toward a small area of colored material. Generally, south of the fenced portion of Block 23 (and White Sand Branch) and south of location B-3, lead concentrations are below 400 mg/kg, with the following exceptions: B-2 (1,750 mg/kg), B-5 (938 mg/kg), B-11 (534 mg/kg), B-14 (433 mg/kg), B-49 (1,330 mg/kg), B-50 (561 mg/kg), B-103 (740 mg/kg), B-108 (5,590 mg/kg), B-114 (766 mg/kg), B-115 (828 mg/kg), and B-121 (1,850 mg/kg). Additional sampling was conducted in the northeastern portion of Block 23 at the following locations: B-45 (1,740 mg/kg) and B-113 (1,280 mg/kg).

Lead concentrations at a depth of 2.0 to 2.5 feet BGS are similar to those of the overlying surficial soil samples, with the exception that concentrations generally decrease with depth along the northern and eastern perimeters (near the fenced portion of the site) and increase with depth along the

southern (south of White Sand Branch) perimeter. East of the fenced portion of the site, lead concentrations were delineated to less than the screening level of 400 mg/kg at B-20, B-50, B-111, B-113, B-122, B-128, and B-129. North of the fenced portion of Block 23, lead concentrations were delineated to less than 400 mg/kg at B-27, B-28, B-33, B-34, B-35, B-36, B-37, B-38, B-39, B-40, B-41, B-42, B-43, and B-44 with the exception of B-45 (431 mg/kg). Lead concentrations within or near the fenced area of burnt waste range from 201 mg/kg (at B-22) to 107,000 mg/kg (at B-17). At test pit or boring locations B-17, B-18, B-22, B-23, B-25, B-26, B-29, and B-30, paint can carcasses, metal, ash, cinders, and multicolored material are the apparent source of the lead contamination detected. South of the fenced portion of Block 23 (and White Sand Branch), lead concentrations are generally higher than those in surficial soils. The soils investigation has delineated the horizontal extent of lead below 400 mg/kg at B-8 (274 mg/kg), B-14 (116 mg/kg), B-50 (7.5 U mg/kg), B-109 (64.9 mg/kg), B-110 (8.2 U mg/kg), B-119 (52.5 mg/kg), B-121 (5.4 U mg/kg), B-124 (7.8 U mg/kg), and B-127 (9.2 mg/kg). However, a strip of borings - B-3 through B-7, B-48, B-49, B-101, B-102, B-106, B-107 and B-108 - show a generally increasing trend in lead concentrations with depth. At the aforementioned borings noted, fill was observed at a depth of 2.0 to 2.5 feet BGS and consists of asphalt, ash, cinders, brick, glass, and multicolored material.

Lead concentrations at a depth of 4.0 to 4.5 feet BGS within Block 23 indicate that the lead delineation is complete north and east of the fenced portion. Further delineation of lead in soils is required in the southern portion of Block 23 (south of White Sand Branch). East of the fenced portion of the site, all lead concentrations (east of White Sand Branch) are lower than the screening level of 400 mg/kg at B-19, B-20, B-26, B-32, B-45, B-46, B-47, and B-112. Along the northern border of Block 23 (at B-27, B-28, B-33, B-34, B-35, B-36, B-37, B-38, B-39, B-40, B-41, and B-43), the lead delineation to less than 400 mg/kg was completed. Lead concentrations within or near the fenced area of burnt waste range from 12.1 mg/kg (at B-30) to 135,000 mg/kg (at B-23) at a depth of 4.0 to 4.5 feet BGS. At test pit or boring locations B-17, B-22, B-23, B-24, B-25, and B-29, fill material, which consisted of brick, ash, cinders, and colored material, was encountered. South of the fenced portion of Block 23 (and White Sand Branch), lead concentrations are generally greater than those in the overlying soils. The soils investigation detected lead concentrations (south of White Sand Branch) above 400 mg/kg, with the exception of B-9 (182 mg/kg), B-14 (7.8 mg/kg), B-119 (58 mg/kg), B-120 (362 mg/kg) and B-121 (5.8 U mg/kg). At the cluster of borings B-1 through B-8, B-48, B-49, B-101 through B-106, B-107, and B-108, lead concentrations generally increase with depth. It should be noted that some of the locations (B-103, B-104, B-105, B-109, B-114, B-115, B-117, and B-118) were 50 to 100 feet within Block 25. The delineation of lead along the southern border of Block 23 required additional sampling horizontally to less than 400 mg/kg near boring locations B-104, B-105, B-114, B-117, B-118, and B-126.

Lead concentrations at a depth of 6.0 to 6.5 feet BGS within Block 23 indicate that the lead delineation is complete horizontally and vertically in the northern and eastern sections of the fenced portion of the site. Further delineation of lead in soils is required in the southern portion of Block 23. East of the fenced portion of the site and east of White Sand Branch, samples for lead analysis were collected and the delineation was complete based on the results. Along the northern border (at

B-27, B-28, B-33, B-34, B-35, B-36, B-37, B-38, B-39, B-40, B-41, and B-43) of Block 23, lead concentrations were lower than 400 mg/kg. Lead concentrations within or near the fenced area of burnt waste range from 13.3 mg/kg (at B-30) to 34,900 mg/kg (at SS-23D). South of the fenced portion of Block 23 (and White Sand Branch), lead concentrations are equivalent to or greater than those in the overlying soils. The soils investigation detected lead concentrations (south of White Sand Branch) above 400 mg/kg, with the exception of B-8 (316 mg/kg), B-109 (8.1 mg/kg), B-118 (21.6 mg/kg), B-119 (8.4 U mg/kg), B-120 (5.2 U mg/kg), B-121 (5.3 U mg/kg), and B-126 (11.5 mg/kg). Soil borings B-1 through B-8, B-48, B-49, B-101 through B-106, B-107, and B-108 show equivalent (within an order of magnitude) or increasing lead concentrations with depth. It should be noted that some of the locations (B-103, B-104, B-105, B-109, B-114, B-115, B-117, and B-118) were within Block 25 but are addressed within Block 23 due to Phase I and Phase II sampling protocols. The delineation of lead along the southern border of Block 23 required additional sampling horizontally and vertically to less than 400 mg/kg near boring locations B-104, B-105, B-114, B-116, and B-117.

The water table generally ranges between 5 and 8 feet BGS depending upon location. It is important to note again that soil samples were collected for analysis below the water table in Block 23.

As per the Modified Work Plan associated with the investigation, sampling was limited to the unsaturated zone in Block 25. The general trend of soil sample results indicates pockets or areas of lead contamination at multiple but generally consistent depths. The two main areas of contamination observed are within the fenced portion of Block 23, Lot 1 and south of the confluence of White Sand Branch and Haney Run Brook. Some of the highest concentrations were observed at depths of 4.0 to 6.5 feet BGS (in both the fenced portion of Block 23, Lot 1 and south of the confluence of White Sand Branch and Haney Run Brook). Additionally, isolated areas of high lead concentrations were sporadically detected within Block 23, Lot 1, and along United States Avenue near location B-3.

Block 25

Analytical results of soil sampling in Block 25 indicate that low (less 400 mg/kg) to moderate (less than 1,210 mg/kg) lead concentrations in surface soils were detected, with the exception of B-511 (3,380 mg/kg), and B-545 (5,170 mg/kg). South of White Sand Branch and Haney Run Brook along the border of Block 25 with Block 23, subsurface lead concentrations were greater than 400 mg/kg (with a few exceptions). The highest concentrations of lead were observed near the border of Block 25 with Block 23 at depths of 4 to 8.5 feet BGS. In the southeastern portion of Block 25, Lot 1 within the Former Landfill Area, lead concentrations were elevated in the subsurface at depths of 2.0 to 4.5 feet BGS, with detected concentrations up to 20,000 mg/kg and most concentrations lower than 5,000 mg/kg. It should be noted that at a depth of 6.0 to 6.5 feet BGS, groundwater was observed across most of the Former Landfill Area. Consistent with the modified Block 25 Work Plan, additional soil collection was not performed below the groundwater table. A detailed summary of lead results for Block 25 is provided below.

Lead contamination of surficial soil in Block 25 is very limited. Lead concentrations range from less than 400 mg/kg around the perimeter of the former landfill, to four isolated groups of lead concentrations ranging up to 5,170 mg/kg. Group 1 of surficial lead contamination is comprised of areas clustered around boring numbers B-526 (675 mg/kg) and B-545 (5,170 mg/kg). Group 2 of surficial lead contamination is comprised of areas clustered around B-515 (461 mg/kg), traversing in a southeasterly direction near B-529 (556 mg/kg). The third group of surficial lead contamination is comprised of areas clustered around boring numbers B-501 (439 mg/kg), B-509 (1,210 mg/kg), B-518 (509 mg/kg), and B-531 (410 mg/kg). Group 4 of surficial lead contamination is comprised of areas clustered around boring number B-511 (3,380 mg/kg).

The horizontal extent of lead contamination greater than 400 mg/kg at a depth of 2.0 to 2.5 feet BGS within Block 25, Lot 1 has been delineated. Two areas of Block 25, Lot 1 with results greater than 400 mg/kg are near the boundary of Block 23 and 25, and in the southeastern portion of Block 25, Lot 1. At location B-511, which is just inside the northeastern portion of the Former Landfill Area, lead concentrations were detected at 6,860 mg/kg. In all locations directly south and west of the B-511 location, lead concentrations were consistently lower than the screening criteria with the exception of B-520 (517 mg/kg). Northwest of B-511 are B-524 and B-538, along the border of Block 23, where lead concentrations were detected at 7,560 mg/kg and 5,360 mg/kg, respectively.

Lead contamination at a depth of 4.0 to 4.5 feet BGS, in Block 25, Lot 1 is similar to that of the overlying unit, with lead concentrations observed at the boundary of Block 23 and 25, and in the southeastern portion of Block 25. At locations B-511, B-518, B-520, and B-531, which are inside the central and northeastern portion of Block 25, Lot 1, lead was detected at 19,700 mg/kg, 5,560 mg/kg, 19,400 mg/kg, and 10,700 mg/kg, respectively. Based on the B-511, B-518, B-520, and B-531 boring logs, colored material and stained soils were observed approximately between 4.0 and 6.0 feet BGS. South and/or east of the aforementioned borings, lead was detected at concentrations below 400 mg/kg.

Delineation of lead contamination at a depth of 6.0 to 6.5 feet BGS in Block 25, Lot 1 was limited due to contact with the groundwater table. Consistent with the Modified Work Plan, once the water table was observed, soil sampling was suspended. Only two soil samples (B-529 and B-531) were collected from Block 25, Lot 1, from a depth of 6 to 6.5 feet. The detected concentrations were 110 mg/kg and 1,300 mg/kg, respectively.

North of Block 23

As part of the United States Avenue Burn Site investigation, US EPA and its subcontractor collected three soil samples for lead analysis and one sample for TAL metals analysis just north of Block 23, within Block 22. All of the samples were collected from a depth of 0.0 to 0.5 foot BGS. The results indicate a decrease in the concentration of lead with distance in a northern direction from Block 23. Lead was detected at concentrations above the screening level of 400 mg/kg at B22-1A (1,190 mg/kg) and B22-2A (1,250 mg/kg), and below 400 mg/kg at B22-3A (319 mg/kg) and B22-4A (328 mg/kg). Weston collected two additional "B" samples (1.5 to 2.0 feet BGS) at B22-1 and B22-2. Lead was detected at concentrations above the screening level of 400 mg/kg at B22-1B (1,250 mg/kg) but below 400 mg/kg at B22-2B (7.8 mg/kg). US EPA has concurred that lead delineation in Block 22 does not require additional sampling under this order.

TAL Metals

Sixty soil samples were collected for US EPA TAL metals plus cyanide analyses. Of the 60 locations sampled, 27 locations had either non-detect results or results that were not in excess of the NJDEP RDCSCC or Non-Residential Direct Contact (NRDC) SCC. At 33 locations, at least one of the following analytes was detected at concentrations above the NJDEP RDCSCC and NRDCSCC criteria: antimony, arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, thallium, and zinc.

The results are summarized below. A "J" qualifier indicates an estimated concentration.

- Antimony was detected at concentrations above the NJDEP RDCSCC of 14.0 mg/kg and below the NJDEP NRDCSCC of 340 mg/kg at the following locations: SB-24A (14.2 J mg/kg), SB-73A (15.4 mg/kg), SB2-1C (154 J mg/kg), SB2-3C (216 mg/kg), SB2-7C (29.5 mg/kg), SB2-8C (14.2 mg/kg), SB2-15B (14.3 mg/kg), SB2-31B (238 mg/kg), SB2-49B (20.0 mg/kg), SB2-115E (23.9 mg/kg), SB2-511C (79.0 mg/kg), SB2-520C (172 mg/kg), WC-15 (36.0 mg/kg), WC-26 (45.5 mg/kg), and WC-29 (80.6 mg/kg).
- Arsenic was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 20 mg/kg at the following locations: SB-18A (264 mg/kg), SB-22A (25.7 mg/kg), SB-23D (221 mg/kg), SB-24A (41.2 mg/kg), SB-25C (45.4 mg/kg), SB2-3C (590 mg/kg), SB2-7C (183 mg/kg), SB2-7H (26.5 J mg/kg), SB2-15B (37.9 mg/kg), SB2-31B (29.8 J mg/kg), SB2-511C (43.0 mg/kg), and SB2-520C (73.7 mg/kg).
- Barium was detected at concentrations above the NJDEP RDCSCC of 700 mg/kg and below the NJDEP NRDCSCC of 47,000 mg/kg at the following locations: SB-18A (7,540 mg/kg), SB-22A (9,230 mg/kg), SB-23A (4,880 mg/kg), SB-23B (835 mg/kg), SB-23C (5,680 mg/kg), SB-23D (5,260 mg/kg), SB-24A (6,590 mg/kg), SB-25C (1,120 mg/kg), SB-73A (2,100 mg/kg), SB2-3A (1,380 J mg/kg), SB2-3C (7,960 J mg/kg), SB2-7C (3,400 J mg/kg), SB2-15B (2,600 J mg/kg),

SB2-25G (1,930 J mg/kg), SB2-31B (18,900 J mg/kg), SB2-31E (3,860 mg/kg), SB2-511C (2,570 J mg/kg), SB2-520C (2,350 J mg/kg), SB2-547A (814 mg/kg), SB2-532AA (2,300 mg/kg), and SB2-527AA (742 mg/kg).

- Beryllium was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 1 mg/kg at the following locations: SB-18A (1.8 mg/kg), SB-23A (2.1 mg/kg), and SB2-547A (1.5 mg/kg).
- Cadmium was detected at concentrations above the NJDEP RDCSCC of 39 mg/kg and/or the NJDEP NRDCSCC of 100 mg/kg at the following locations: SB-18A (62.9 mg/kg), SB-22A (113 mg/kg), SB-24A (81 mg/kg), SB-73A (61.9 mg/kg), SB2-8C (135 J mg/kg), SB2-511C (40.7 mg/kg), WC-21 (53.7 mg/kg), and WC-26 (119 J mg/kg).
- Chromium was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 500 mg/kg at the following locations: SB-18A (1,960 mg/kg), SB-22A (2,730 mg/kg), and SB2-31B (4,620 mg/kg).
- Copper was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 600 mg/kg at the following locations: SB-18A (1,760 mg/kg), SB-23D (679 mg/kg), SB-24A (1,870 mg/kg), SB-73A (1,410 mg/kg), SB2-3C (638 mg/kg), SB2-511C (1,800 mg/kg), and SB2-520C (780 J mg/kg).
- Lead was detected at concentrations above the NJDEP RDCSCC of 400 mg/kg and/or above the NJDEP NRDCSCC of 600 mg/kg at the following locations: SB-18A (37,100 mg/kg), SB-22A (49,100 mg/kg), SB-23A (12,000 mg/kg), SB-23B (700 mg/kg), SB-23C (9,580 mg/kg), SB-23D (15,900 mg/kg), SB-24A (12,300 mg/kg), SB-25C (546 mg/kg), SB-73A (29,200 mg/kg), SB2-1C (35,300 J mg/kg), SB2-1H (4,220 J mg/kg), SB2-3A (3,190 mg/kg), SB2-3C (55,100 mg/kg), SB2-7C (5,200 mg/kg), SB2-7H (431 mg/kg), SB2-8C (8,720 J mg/kg), SB2-15B (8,400 mg/kg), SB2-25G (1,660 mg/kg), SB2-31B (33,500 mg/kg), SB2-31E (3,860 mg/kg), SB2-49B (4,260 J mg/kg), SB2-115E (3,540 mg/kg), SB2-511C (6,020 mg/kg), SB2-520C (7,870 mg/kg), WC-15 (8,150 J mg/kg), WC-21 (6,080 J mg/kg), WC-26 (23,200 J mg/kg), WC-27 (1,120 J mg/kg), WC-29 (12,800 J mg/kg), SB2-532AA (639 mg/kg), and SB2-527AA (1,360 mg/kg).
- Mercury was detected at SB-23D (131 mg/kg) at a concentration above the NJDEP RDCSCC of 14 mg/kg but below the NRDCSCC of 270 mg/kg.
- Thallium was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 2 mg/kg at the following locations: SB2-3C (10.3 J mg/kg), SB2-116A (7.5 J mg/kg), WC-15 (7.4 J mg/kg), and WC-29 (10.1 J mg/kg). It should be noted that these are estimated values and are tentatively identified.

- Zinc was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 1,500 mg/kg at the following locations: SB-18A (9,840 J mg/kg), SB-22A (51,900 mg/kg), SB-23A (56,500 mg/kg), SB-24A (56,600 J mg/kg), SB-73A (98,500 mg/kg), SB2-3C (13,200 J mg/kg), SB2-7C (4,560 J mg/kg), SB2-15B (4,700 J mg/kg), SB2-31B (7,770 J mg/kg), SB2-511C (10,900 J mg/kg), SB2-520C (17,800 J mg/kg), SB2-532AA (2,640 J mg/kg), and SB2-527AA (4,450 J mg/kg).

The following summarizes the TAL metals results:

- Sixteen soil samples were collected in Block 25 and analyzed for TAL metals. Eleven of the 16 samples had at least one metal concentration exceeding NJDEP RDCSCC.
- A comparison of lead concentrations with concentrations of other metals by location showed lead to be highly collocated with these metals.
- The concentrations detected in the samples collected north of the fenced area of Block 23, indicate that the levels of TAL metals in soils are lower than the NJDEP criteria (consistent with locations B-26, B-28, and B-36).
- East of the fenced portion of Block 23, soil samples from locations B-111 and B-123 confirm that the delineation for metals has been complete, with the exception of one location (i.e., B22-1).
- Within the fenced portion of Block 23, four locations (B-18, B-22, B-23, and B-25) were sampled for TAL metals analysis. Analytical results of these samples indicate that TAL metals are present at concentrations greater than the NJDEP RDCSCC from the surface to a depth of 8.5 feet BGS.
- South of the confluence of White Sand Branch and Haney Run Brook, TAL metals samples were collected at B-1, B-3, B-7, B-8, B-20, B-49, B-50, B-105, B-115, B-116, B-124, and B-127. At soil borings B-3, B-20, B-50, B-105, B-116, B-124, and B-127 metals were undetected or were present at concentrations lower than NJDEP criteria.

Volatile Organic Compounds

A total of 33 soil samples were collected for US EPA TCL VOC analysis. Sample locations and depths were selected to provide coverage of the area that had been delineated for lead, with bias towards areas of elevated lead concentrations. Table 3-3 summarizes the results. VOCs were not detected at concentrations exceeding the NJDEP RDCSCC, NRDCSCC, and Impact to Groundwater (IGW) SCC.

Semivolatile Organic Compounds

Thirty-three soil samples were collected for US EPA TCL SVOC analysis. Of the 33 locations sampled, 27 locations had either nondetect results or results that did not exceed the NJDEP RDCSCC. Analytical results of six of the 33 soil samples (including a duplicate) indicated the presence of one or more of the following seven compounds at concentrations exceeding the NJDEP RDCSCC and/or NRDCSCC: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, chrysene, and dibenz(a,h)anthracene. These results are summarized below.

- Benzo(a)anthracene was detected at concentrations above the NJDEP RDCSCC of 0.9 mg/kg at the following locations: SB-23A (1,000 ug/kg), SB2-15B (1,000 ug/kg), SB2-509G (10,000 ug/kg), and SB2-511C (1,400 J ug/kg). The concentration of benzo(a)anthracene in the QA/QC duplicate sample for location SB-73A was 780 mg/kg, which is lower than the NJDEP criteria.
- Benzo(a)pyrene was detected at concentrations above the NJDEP RDCSCC and NRDCSCC of 0.66 mg/kg at the following locations: SB-23A (1,200 ug/kg), SB-73A (800 ug/kg), SB2-15B (1,100 ug/kg), SB2-31B (710 J ug/kg), SB2-509G (8,500 ug/kg), and SB2-511C (1,700 J ug/kg).
- Benzo(b)fluoranthene was detected at concentrations above the NJDEP RDCSCC of 0.9 mg/kg but below the NRDCSCC of 4 mg/kg at the following locations: SB-23A (1,600 ug/kg), SB-73A (1,200 ug/kg), SB2-15B (1,400 ug/kg), SB2-509G (6,200 ug/kg), and SB2-511C (1,700 J ug/kg).
- Chrysene was detected at SB2-509G (9,900 ug/kg) at a concentration above the NJDEP RDCSCC of 9.0 mg/kg but below the NJDEP NRDCSCC of 40 mg/kg.
- Dibenz(a,h)anthracene was detected at SB2-509G (1,400 J ug/kg) at a concentration above the NJDEP RDCSCC and NRDCSCC of 0.66 mg/kg.
- Indeno (1,2,3-cd)pyrene was detected at concentrations above the NJDEP RDCSCC of 0.9 mg/kg at the following locations: SB-23A (1,200 ug/kg), SB-73A (970 ug/kg), SB2-15B (1,100 ug/kg), SB2-509G (4,400 ug/kg), and SB2-511C (1,200 J ug/kg). At SB2-509G, indeno(1,2,3-cd)pyrene was also detected at a concentration above the NJDEP NRDCSCC of 4.0 mg/kg.

In summary, three of the soil samples collected for SVOC analysis within Block 23 contained SVOCs at concentrations above the NJDEP RDCSCC. Two of these three samples (SB-23A and its duplicate SB-73A) were collected within the chain-link fence erected pursuant to a NJDEP Directive to prevent public access to the visible burnt waste area of Block 23, Lot. SB2-15B also contained SVOCs at concentrations above the NJDEP RDCSCC. This sample location is slightly west of the burnt waste area and is approximately 12 feet within the subsequently enlarged fence erected pursuant to an US EPA 1995 Removal AOC adjacent to United States Avenue. Within Block 25, one of the soil samples, SB2-511C, was collected within a borehole that exhibited visible (colored material) contamination. At B-509G, blue and green colored material was observed between a depth of 2.0 and 4.0 feet BGS; however, the on site Weston geologist observed colored material and fill being pushed deeper by the auger drilling. Therefore, the SVOCs detected can be attributed to the drilling activities. The compounds and concentration detected are similar to those obtained from shallower depths and seem to support this conclusion. At B-511C, blue colored material was observed between a depth of 2.0 and 4.0 BGS.

TCLP VOCs, SVOCs, and Metals

A total of four soil samples were collected for TCLP VOC, SVOC, and metals plus copper and zinc analyses within Block 23. Three soil samples within Block 25 and one sample within Block 23 were analyzed for TCLP metals plus copper and zinc analyses. The samples were collected from locations where high concentrations of lead had previously been detected. The results are presented below and summarized in Table 3-3.

The results of the five soil samples collected within Block 23, Lot 1 for TCLP analysis indicated that two metals (barium and lead) exceeded the RCRA criteria. VOCs and SVOCs were not detected in all five samples analyzed. The concentration of barium exceeded the RCRA criterion of 100 mg/L in one of five samples (SB-23A collected from 0 to 0.5 foot BGS) with a concentration of 173 mg/L. Barium was detected at a concentration lower than the RCRA standard at the same location (SB-73C [2.280 mg/L]); however, this sample was collected at a depth of 4.0 to 4.5 feet BGS. The concentration of lead exceeded the standard of 5.0 mg/L at four of five soil-sampling locations (SB-23A, SB-73C, SB2-7C, and SB2-25B). Three of these sampling locations, SB-23A, SB-73C, and SB2-25B, which had lead concentrations of 94.2 mg/L, 70 mg/L, and 808 mg/L, respectively, were all within the fenced portion of Block 23, Lot 1. The other sample, SB2-7C, had a lead concentration of 80.4 mg/L and was near the border of Block 23 and Block 25. It should be noted that SB2-29A is also within the fenced portion of Block 23. At this location, the concentration of lead (0.235 mg/L) was lower than the RCRA criterion of 5 mg/L.

The results of the three samples collected within Block 25, Lot 1 (SB-511A, SB-529C, and SB-532A) for TCLP metals plus copper and zinc analyses indicate that one analyte exceeded the RCRA criterion. Lead exceeded the standard of 5.0 mg/L at one of three soil-sampling locations (SB-511A

[33.5 mg/L]), which was near the northern border of the Former Landfill Area. It should be noted that lead concentrations of 1.41 mg/L and 0.786 mg/L were detected at SB2-529C and SB2-532A, respectively. These concentrations are lower than the RCRA criterion.

TCLP soil samples collected in both blocks were reviewed and compared to the initial lead screening and/or TAL metals samples collected at the same location. Five of the eight TCLP locations were sampled for lead only. The analytical results of the initial lead screening samples indicated that the concentrations of lead in soils ranged from 313 mg/kg at SS-532A to 174,000 mg/kg at SS-7C. The remaining three TCLP sample locations were sampled for TAL metals. The concentrations of lead ranged from 639 mg/kg at SS2-532A to 12,000 mg/kg at SS-23A.

It should be noted that the analysis of initial lead screening sample SS-7C indicated a lead concentration of 174,000 mg/kg; TAL metals analysis of this sample indicated a lead concentration of 5,200 mg/kg. TCLP analysis of SS-7C indicated a lead concentration of 80.4 mg/L. The analytical result of initial lead screening sample SS-23A (collected from the center of burnt waste) indicated a lead concentration of 4,950 mg/kg; TAL metals analysis of this sample indicated a lead concentration of 12,000 mg/kg. TCLP analysis of SS-23A indicated a lead concentration of 94.2 mg/L. The highest TCLP result for lead was 808 mg/L detected in sample SS2-25B. At this location, the analytical result of the initial lead screening was 18,500 mg/kg.

Statistical Analysis of Metals Results

Weston performed a statistical analysis of the metals data to focus and better understand the information collected to date. As illustrated in Table 3-4, approximately one half of all samples analyzed for metals (except thallium) contained these analytes in concentrations below the NJDEP RDCSCC, as indicated by the statistical median and the number of detections above RDCSCC.

Because of the large number of low-level concentrations, the data are skewed, as indicated by the skewness value. The fourth quartile often contains a small number of high-concentration values, typically at least one order of magnitude above the respective RDCSCC. This results in sharp "spikes" as evidenced by the high kurtosis value. The high kurtosis values indicate that although the magnitude of the exceedances may be large, the number of such observations is limited. When the data do not contain such high values, the mean concentration of all samples is lower than the respective RDCSCC.

Sherwin Williams and Weston believe, though US EPA does not necessarily agree, that the large number of samples containing analytes in concentrations below RDCSCC indicates that the sampling frequency (when viewed in conjunction with the spatial distribution of the sampling locations) was adequate to delineate the extent of contaminated soils. It also indicates that extreme elevated concentrations represent localized areas rather than a uniform, widespread occurrence.

Based on the information available from the data collected to date, the estimated volume of material in Blocks 23 and 25 above the groundwater table with concentrations of lead greater than the NJDEP RDCSCC of 400 mg/kg was determined to be 39,000 cubic yards. The estimated volume of material in Blocks 23 and 25 above and below the groundwater table with concentrations of lead greater than the NJDEP RDCSCC of 400 mg/kg was determined to be 46,925 cubic yards. The estimated volume of contaminated material will be revised at the conclusion of the RI/FS activities.

3.2.1.2 Sediment

During the Phase II RI of The Paint Works Corporate Center conducted by Weston between June 1993 and October 1993 on behalf of Sherwin-Williams, two sediment samples were collected from Haney Run Brook. Arsenic, barium, and lead were detected in one sediment sample.

Sediment samples were taken from the same three locations sampled for surface water quality characterization. The analytical data are summarized in Table 3-5. Four target VOCs were detected in the sediment samples collected from Haney Run Brook, but none of those VOCs were detected at concentrations exceeding the calculated Sediment Screening Criteria. Target VOCs and TICs were identified in sediment samples collected within AEC V. Four target VOCs were detected in the sediment samples collected from Haney Run Brook. These target VOCs are acetone, 2-butanone, 1,1,2-trichloroethane and toluene. VOC TICs were identified in samples 007-S002 (location SSW-7), 007-M102 (duplicate of 007-S002), and 008-S002 (location SSW-8) with estimated total concentrations of 630 ug/kg, 800 ug/kg, and 180 ug/kg, respectively. Twelve target SVOCs were detected in the sediment samples collected from Haney Run Brook, but none of the concentrations of those SVOCs exceeded the calculated Sediment Screening Criteria. SVOC TICs were identified in each of the sediment samples collected from Haney Run Brook. Estimated concentrations of SVOC total TICs in sample 007-S002 (location SSW-7), 007-M102 (duplicate of 007-S002), and 008-S002 (location SSW-8) were 92,900 ug/kg, 25,400 ug/kg, and 12,000 ug/kg; respectively.

Results of the TAL inorganic analyses resulted in the detection of 21 chemical constituents. Six of these constituents were in excess of the NJDEP Sediment Quality Criteria. These were silver, arsenic, chromium, lead, cadmium, and zinc. In sample 007-S002 (location SSW-7), arsenic (1,560 mg/kg), lead (1,270 mg/kg) and zinc (3,020 mg/kg) were detected above guidance criteria. In the duplicate sample 007-M102 (duplicate of sample 007-S002), silver (2.6 mg/kg), arsenic (376 mg/kg), cadmium (11 mg/kg), chromium (215 mg/kg), lead (2,330 mg/kg), and zinc (9,850 mg/kg) exceeded guidance values. In sample 008-S002 (location of SSW-8) NJDEP guidance criteria was exceeded for silver (3.0 mg/kg), arsenic (261 mg/kg), lead (1,540 mg/kg), cadmium (15.6 mg/kg), lead (1,540 mg/kg), and zinc (7,140 mg/kg). These metals are expected to be naturally concentrated by the naturally high organic content of bottom sediments in the creek. It should be noted that the constituents detected in the surface water and sediments within the creek are not consistent with those detected in groundwater upgradient of the creek within the former landfill area.

During the SI conducted by NJDEP on 20 May 1994, sediment samples were collected. Several VOCs and SVOCs were detected in the sediment sample collected from Haney Run Brook, adjacent to AOC No. 1. Various inorganic analytes were detected in both of the sediment samples collected adjacent to AOC No. 1. Bis(2-ethylhexyl)phthalate, TPHs, and several metals were detected in the sediment samples collected from Haney Run Brook, adjacent to AOC No. 3.

During the United States Avenue Burn Site removal action investigation conducted by Weston in 1995 and 1996, sediment samples were collected from water bodies (White Sand Branch, Haney Run Brook, and Bridgewood Lake) located upstream, downstream, and adjacent to the United States Avenue Burn site. A total of 38 sediment samples including 4 duplicates and 1 replicate were collected from 17 locations. The results of sediment samples collected from Haney Run Brook indicated that seven metals (arsenic, cadmium, copper, lead, mercury, thallium, and zinc) were detected at concentrations greater than the conservative Ontario LEL guideline for protection of freshwater biota; only lead and arsenic exceeded the Ontario SEL guideline. The analytical results for the sediment samples collected during the United States Avenue Burn Site investigations are presented below.

- TAL metals were detected at concentrations exceeding the Ontario LEL and SEL in six of 12 sediment samples analyzed (including QC duplicate samples). Of the 23 TAL metals analyzed for, arsenic, cadmium, copper, lead, mercury, and zinc were detected at concentrations greater than the Ontario guidelines. There are no Ontario sediment guidelines for 14 of the 24 analytes.
- Concentrations of two analytes, arsenic and lead, exceeded the Ontario SEL standard in sediment samples. Cadmium, copper, mercury, and zinc exceeded the more conservative Ontario LEL guidelines. The results of the TAL metals and cyanide analyses are presented in Table 3-5.
- Lead was detected in sediments at concentrations exceeding the Ontario LEL of 31 mg/kg at 26 of 39 locations. The Ontario SEL of 250 mg/kg for lead was exceeded in 15 of 39 samples (including 2 QC duplicate samples). Lead concentrations ranged from 6.0 mg/kg at SD09B to 14,700 mg/kg at SD08A. The results of the lead sampling are presented in Table 3-5.
- Arsenic was detected in five of 12 samples at concentrations exceeding the LEL of 6.0 mg/kg and/or the SEL of 33 mg/kg; the highest concentration was detected in sample SD-20A at 162 J mg/kg.
- Cadmium was detected in three of 12 sediment samples at concentrations exceeding the LEL of 0.6 mg/kg but less than the SEL of 10 mg/kg; the highest concentration (3.5 J mg/kg) was detected in sample SD-20A.

- Copper was detected in one of 12 sediment samples at concentrations exceeding the LEL of 16 mg/kg but less than the SEL of 110 mg/kg; the highest concentration was detected in sample SD-20B at 18.7 J mg/kg.
- Mercury was detected in two of 12 sediment samples at concentrations exceeding the LEL of 0.2 mg/kg but less than the SEL of 2 mg/kg; the highest concentration was detected in sample SD-09A at 0.71 mg/kg.
- Zinc was detected in one of 12 sediment samples at a concentration exceeding the LEL of 120 mg/kg but less than the SEL of 820 mg/kg; the highest concentration was detected in sample SD-20B at 212 J mg/kg.
- There are no Ontario sediment guidelines established for VOCs. TCL VOCs that were detected in the sediment samples include 2-butanone, acetone (attributed to laboratory contamination), carbon disulfide, ethylbenzene, toluene (at one location), and xylene. The VOC results are presented in Table 3-5.
- US EPA TCL SVOCs detected in sediment were the same as those detected in waste/soil. SVOCs exceeded conservative Ontario Provincial Sediment quality (LEL) guidelines in two of 12 samples analyzed (SD-03 and SD-09). The compounds detected at concentrations above the Ontario LEL were all PAHs. SD-09 is located adjacent to a road and may be influenced by runoff. The TCL SVOC results and total PAH results are presented in Table 3-5. These SVOCs may be attributable to roadway runoff.
- Two sediment samples for lead were collected from Bridgewood Lake at the request of US EPA. Sediment samples SD-12 and SD-13, which were collected from within the lake, detected concentrations of lead at 1,420 and 1,360 mg/kg, respectively.

TAL Metals

The TAL metals arsenic, cadmium, copper, lead, mercury, and zinc were detected in sediment samples collected from White Sand Branch and Haney Run Brook at concentrations exceeding the Ontario LEL or SEL sediment quality guidelines (Table 3-5).

- A total of 39 sediment samples were collected for TAL metals (12 samples) and lead (27 samples) analyses. The concentration of lead exceeded the Ontario LEL of 31.0 mg/kg in 26 of the 39 samples at sediment locations along White Sand Branch and Haney Run Brook. The Ontario SEL lead criterion was calculated to 250 mg/kg; the concentrations of lead in 15 of the 39 sediment samples were above the SEL. It should be noted that high lead concentrations were detected in upstream sediment samples in White Sand Branch (SD-8) and in Haney Run Brook (SD-24B).

- Arsenic (25.4 J mg/kg) was detected at an upstream location (SD-24) in Haney Run Brook at a concentration exceeding the Ontario LEL of 6 mg/kg, and at the downstream locations SD-09A (12 mg/kg), SD-20A (162 J mg/kg), and SD-20B (89.4 J mg/kg). Arsenic was undetected at SD-21A (10.6 UJ mg/kg), SD-21B (7.9 UJ mg/kg), SD-22A (9.8 UJ mg/kg), SD-22 (6.6 UJ mg/kg), SD-23A (8.1 UJ mg/kg), SD-23B (7.1 UJ mg/kg), and SD-24A (7.45 UJ mg/kg).
- Cadmium was detected at three of 12 locations at concentrations greater than the Ontario LEL of 0.6 mg/kg: at SD-03A (2.2 mg/kg), SD-20A (3.5 J mg/kg), and SD-20B (2.3 J mg/kg).
- Copper was detected at 11 of 12 locations; however, the concentration of this analyte exceeded the Ontario LEL of 16 mg/kg at only one location (SD-20B at 18.7 J mg/kg).
- Mercury was detected at two of 12 locations at concentrations above the Ontario LEL of 0.2 mg/kg, but below the SEL of 2 mg/kg, at SD-09A (0.71 mg/kg) and SD-20B (0.21 J mg/kg).
- Zinc was detected at two of 12 locations at concentrations above the Ontario LEL of 120 mg/kg, but below the SEL of 820 mg/kg, at SD-09A (183 mg/kg) and SD-20B (212 J mg/kg).

Volatile Organic Compounds

There are no criteria established for VOCs. VOCs detected at scattered locations in sediment include 2-butanone, acetone, toluene, carbon disulfide, ethylbenzene, and xylene (Table 3-5).

Semivolatile Organic Compounds

Benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, flouranthene, indeno(1,2,3-cd)pyrene, and pyrene were detected in sediments at 2 of 12 locations at concentrations above the Ontario LEL guidelines. None of these compounds were detected at concentrations above the SEL guidelines. These compounds were also detected in surficial soils at the United States Avenue Burn Site.

- Benzo(a)anthracene was detected in one of 12 (SD-09A) samples at a concentration of 1,600 J ug/kg, which is above the LEL of 0.32 mg/kg but below the SEL of 37.44 mg/kg.
- Benzo(a)pyrene was detected in one of 12 samples (SD-09A) at a concentration of 1,300 ug/kg, which is above the Ontario LEL of 0.37 mg/kg but below the SEL of 36.42 mg/kg.
- Benzo(g,h,i)perylene was detected in two of 12 sediment samples (SD-03A [200 J ug/kg] and SD-09A [630 J ug/kg]) at concentrations above the LEL of 0.17 mg/kg but below the SEL of 8.10 mg/kg.

- Chrysene was detected at one of 12 sampling locations (SD-09A) at a concentration of 1,700 J ug/kg, which is above the Ontario LEL of 0.34 mg/kg but below the SEL of 11.64 mg/kg.
- Dibenz(a,h)anthracene was detected at two of 12 locations (SD-03A [80 J ug/kg] and SD-09A [250 J ug/kg]) at concentrations above the Ontario LEL of 0.06 mg/kg but below the SEL of 3.29 mg/kg.
- Fluoranthene was detected at one of 12 sediment locations (SD-09A) at a concentration of 3,400 ug/kg, which is above the Ontario LEL of 0.75 mg/kg but below the SEL of 25.81 mg/kg.
- Indeno(1,2,3-cd)pyrene was detected in one of 12 sediment samples (SD-09A [720 mg/kg]) at a concentration above the LEL of 0.2 mg/kg but below the SEL of 8.10 mg/kg.
- Pyrene was detected in one of 12 sediment samples (SD-09A [1200 J ug/kg]) at a concentration exceeding the Ontario LEL of 0.49 mg/kg but below the SEL of 21.51 mg/kg.

3.2.1.3 Surface Water

As part of The Paint Works Corporate Center Phase II RI conducted by Weston between June 1993 and October 1993, the Former Landfill Area and portions of Haney Run Brook were investigated further. Two surface water samples were collected from Haney Run Brook to determine whether surface water quality within Haney Run Brook had been impacted. Bis(2-ethylhexyl)phthalate and several metals were detected in at least one surface water sample.

NJDEP conducted a SI in this area on 20 May 1994. One surface water sample was collected from White Sand Branch, and one surface water sample was collected from Haney Run Brook, within Block 23, Lot 1. Two surface water samples were collected from Haney Run Brook within Block 25, Lot 1. According to the NJDEP SI report, methylene chloride, bis(2-ethylhexyl)phthalate, and metals were detected in surface water samples collected near the burnt waste area. Methylene chloride (possibly a laboratory contaminant) and inorganic compounds were detected in the surface water samples collected from Haney Run Brook in Block 25, Lot 1 during the SI.

During the June 1996 Phase III sampling event, surface water samples were collected at five locations within Haney Run Brook.

Surface water sampling was performed at three locations along Haney Run Brook as part of Phase II activities. Analytical results are presented in Table 3-6. Since the above investigations were conducted either by or under the oversight of the NJDEP, the State of New Jersey FW2 standards were utilized. During preparation of this work plan, the Federal Criteria for Maximum Concentration (CMC) were substituted (e.g. Tables 3-6, 3-10, & 3-14). This was done for the

purpose of preserving the integrity of the original documents, which were prepared and submitted under a different regulatory program. Therefore, these comparisons are not being used to determine overall surface water quality exceedances with respect to conclusions that will need to be drawn for the RI/FS for the sites since all FW2 classified waters in the State of New Jersey must meet the Criteria of the Federal Toxic Rule as shown in 40 CFR Part 131 Subpart D Federal Promulgated Water Quality Standards Chapter 1. The latest New Jersey Water Quality Standards NJAC 7:9B Standards are only used for the FW2 exceptions referenced in 40 CFR §131.36 (d)(3)(ii), and if the New Jersey State Criteria for any specific substance is more stringent than the Federal Toxic Rule criteria. Further, the Federal Surface Water Quality Metals Criteria from the Toxic Rule is based on a calculation of ambient total hardness in mg/L to determine the dissolved form metals criteria. Surface water total hardness data will be collected as part of this RI/FS and will assist in properly defining surface water quality exceedances in all subsequent documents to be submitted as part of this RI/FS. Discussions of existing analytical results in these surface water sections are provided for informational purposes only and as a screening tool to assist in identifying potential areas of concern.

The data shows that target VOCs were not detected in the three surface water samples collected from Haney Run Brook. This table also shows that one target SVOC was detected in the three surface water samples taken from Haney Run Brook. Bis(2-ethylhexyl)phthalate was detected in sample 007-M102 (duplicate sample of 007-W002) at an estimated J-value concentration of 3 ug/L, which exceeds the surface water quality criterion. This result, however, was not reproduced in the environmental sample (007-W002). Since bis(2-ethylhexyl)phthalate is a common laboratory and field cross-contaminant, the one occurrence of the compound does not represent an environmental concern. Metal constituents were identified in the surface water samples collected. In sample 007-M102 (duplicate sample of 007-W002), aluminum, arsenic, iron, lead, and cyanide were detected at concentrations above NJDEP guidance criteria concentrations of 3,050 ug/L, 99 ug/L; 25,100 ug/L; 183 ug/L; and 0.000018 ug/L, respectively. In the duplicate sample only iron was detected at above the NJDEP guidance criteria with a concentration of 5,530 ug/L. In sample 008-W002 (location SSW-8), aluminum (3,010 mg/L), arsenic (79 ug/L), iron (23,600 mg/L) and lead (126 ug/L) were detected at concentrations above NJDEP guidance criteria.

Tentatively identified compounds were detected in only one surface water sample, 007-W002 (sample collected at SSW-7), with an estimated total concentration of 10 ug/L SVOC TICs. No other TICs, SVOC or VOCs, were detected in the surface water samples collected from this area.

The analytical results for the surface water samples collected during the United States Avenue Burn site investigation under the oversight of the US EPA Removal Branch are presented below.

- Aluminum was detected in five surface water samples (SW-20, SW-21, SW-22, SW-23, and SW-24) at concentrations below the acute criterion of 750 ug/L (but above the NJDEP FW-2

chronic criterion of 87.0 ug/L). Aluminum concentrations ranged from 354 J ug/L at SW-22 to 670 J ug/L (the highest concentration detected) in sample SW-23.

- Iron was detected above the NJDEP FW-2 chronic criterion of 1,000 ug/L in two of five samples from 1,330 ug/L at SW-24 to 1,630 ug/L at SW-23.
- Lead was detected in all five surface water samples (SW-20, SW-21, SW-22, SW-23, and SW-24) at concentrations above the NJDEP FW-2 calculated chronic criterion and the US EPA acute levels. Lead concentrations ranged from 3.1 ug/L at SW-24 to 9.7 ug/L in sample SW-23. The results of surface water TAL metals analyses are presented in Table 3-6.
- Chlorobenzene, ethylbenzene, styrene, tetrachloroethane, toluene, and xylene were detected in surface water sample location SW-23. This was the only surface water sample that contained VOCs, and is located in Haney Run Brook upstream of the site. The surface water VOC results are presented in Table 3-6.
- All of the SVOCs analyzed for were undetected with the exception of pentachlorophenol. Pentachlorophenol was undetected; however, the contract-required detection level for this compound was exceeded at all locations. The surface water SVOC results are presented in Table 3-6.

Analytical results of surface water samples collected from Haney Run Brook indicate that three metals (aluminum, iron, and lead) were detected at concentrations greater than the US EPA FW CMC (acute) or NJDEP FW-2 criteria. Aluminum and iron may be attributed to natural conditions. VOC and SVOC analyses of surface water indicated that there were no compounds detected at concentrations greater than the US EPA FW CMC (acute) or NJDEP FW-2 criteria.

3.2.1.4 Groundwater

NJDEP inspected the Former Landfill Area (Block 25, Lot 1) on 31 July and 16 September 1975. The inspections included the sampling of four existing monitoring wells installed by Sherwin-Williams in 1974. NJDEP resampled the wells on 5 May 1976. Based on the results of the two sampling rounds, NJDEP determined that Sherwin-Williams' treatment and disposal practices had impacted groundwater quality. NJDEP identified barium, phenol, and lead as the primary analytes of concern.

In 1981, Sherwin-Williams installed four replacement-monitoring wells in the vicinity of the Former Landfill Area to monitor post-closure groundwater quality. The original monitoring wells had been damaged or destroyed as a result of removal activities. Previously, groundwater samples had been collected from monitoring wells located in the vicinity of the Former Landfill Area since 1975. Barium, cadmium, lead, benzene, chloroform, toluene, xylenes, ethylbenzene,

heptane, and phenol were detected in at least one groundwater sample collected from the monitoring wells between 1981 and 1988.

To evaluate present conditions within the former landfill area, a soil and groundwater investigation was conducted. The four existing monitoring wells (renamed MW-7, 8, 9, 10) located around the perimeter of the former pit areas were utilized for the investigation. These wells were installed by Sherwin-Williams in 1981 to monitor post-closure groundwater quality.

The wells were installed to depths from 15 to 20 feet BGS. The wells were screened in the native soils/overburden to evaluate the impact of the overlying municipal waste and sludge. As discussed previously, sludge had been removed in 1979.

The wells were installed by Craig Test Boring Company, Inc. in accordance with NJDEP regulations. The wells were constructed of 4-inch PVC casing and 20-slot PVC screen. Locked steel casings were installed to secure the wells.

Two rounds of samples were collected and analyzed for PP VOA+15, PP BNA, lead, chromium, barium, and phenols. To evaluate the nature of soils in the former pit areas, nine (9) soil boring locations were drilled. Three soil borings were located within each of the former pit areas. Locations were determined based on the pre-closure subsurface investigation conducted by Sippel and Masteller Associates, Inc. in 1978.

Groundwater samples were collected from four monitoring wells during four rounds of groundwater sampling conducted during the Phase I and Phase II RI in AEC V. The analytical data are presented in Table 3-7 and Figure 3-8.

Target VOCs were identified in 009-M001 (MW-9, Round I), 007-M002 (MW-7, Round II), 008-M002 (MW-8, Round II), 009-M002 (MW-9, Round II), 010-M002, (MW-10, Round II) 007-M003 (MW-7, Round III), 009-M003 (MW-9, Round III), 007-M004 (MW-7, Round IV), 007-M104 (duplicate of 007-M004), and 009-M004 (MW-9, Round IV) above NJDEP groundwater standards. These compounds include benzene, xylene (total) and methylene chloride. Benzene was detected at concentrations of 23 ug/L (009-M001) -MW-9, Round I-; 62 ug/L (009-M002) -MW-9, Round II-; 2 ug/L (007-M003, estimated) -MW-7; Round III-, 31 ug/L (009-M003) -MW-9, Round III-; 2 ug/L (007-M004, estimated) -MW-7, Round IV; 3 ug/L (007-M104, estimated) -duplicate of 007-M004-; and 34 ug/L (009-M004) -MW-9, Round IV-. Xylene (total) was detected above groundwater standards in samples 009-M001 (MW-9, Round I) and 009-M002 (MW-9, Round II) with concentrations of 53 ug/L and 91 ug/L, respectively. In summary, benzene was detected four times in four rounds of sampling at concentrations in the low ppb range in MW-9 and twice in four rounds of sampling (rounds III and IV) at estimated J-value concentrations in MW-7. Xylene was detected twice in four rounds of sampling (Rounds I and II) in MW-9.

The only occurrences of methylene chloride not associated with laboratory blanks were present during Round II. This compound was detected in all four wells within AEC I in Round II and all methylene chloride results were above groundwater criteria. Although methylene chloride was not detected in the method blanks during this round, it was detected in the trip blank associated with this sampling event. This indicates cross-contamination during storage, laboratory contamination, and/or shipment of the samples. It must be noted that when detected, this compound was always associated with laboratory blanks in the other three rounds of groundwater sampling.

VOC TICs were identified during Phase II activities in samples 008-M003 (MW-8, Round III), 009-M003 (MW-9, Round III), 010-M003 (MW-10, Round III), 007-M004 (MW-7, Round IV), and 007-M104 (duplicate of 007-M004) with estimated total concentrations of 9 ug/L, 14 ug/L, 10 ug/L, 65 ug/L, and 5 ug/L, respectively.

Pentachlorophenol was the only target SVOC detected at concentrations exceeding the NJDEP Class II-A groundwater standards. Pentachlorophenol was the only SVOC detected above standards. Elevated concentrations of pentachlorophenol were detected in 007-M001 (7 ug/L, estimated) -MW-7, Round I; 009-M001 (8 ug/L, estimated) -MW-9, Round I; 007-M002 (9 ug/L, estimated) -MW-7, Round III; 009-M002 (13 ug/L, estimated) -MW-9, Round II; 007-M003 (12 ug/L) -MW-7, Round III; 009-M003 (7 ug/L, estimated) -MW-9, Round II; 007-M004 (9 ug/L, estimated) -MW-7; Round IV; 007-M104 (4 ug/L, estimated) duplicate of 007-M004; and 009-M004 (5 ug/L, estimated) -MW-9, Round IV).

SVOC TICs were identified in groundwater samples collected during Phase II activities. SVOC TICs were detected in sample 007-M003 (91 ug/L) -MW-7, Round III, 009-M003 (98 ug/L) -MW-9, Round III, 010-M103 (47 ug/L) duplicate of 010-M003, 007-M004 (31 ug/L) -MW-7, Round IV, 007-M104 (80 ug/L) duplicate of 007-M004, and 009-M004 (247 ug/L) -MW-9, Round IV.

Results of Phase II sampling indicated that total barium and total lead concentrations exceeded the NJDEP groundwater standards. Elevated concentrations of total barium were detected in one well within this AEC in 007-M004 (2.4 mg/L) -MW-7, Round IV, 007-M104 (2.5 mg/L) -duplicate of 007-M004, and 007-M003 (2.4 mg/L) -MW-7, Round III. Soluble results indicated elevated barium concentrations in 007-M004 (MW-7, Round IV) at a concentration of 2.1 mg/L. Total lead was elevated in all groundwater samples in this area except for 008-M003 (MW-8, Round III) and 010-M004 (MW-10, Round IV). Total lead concentrations ranged between 0.0235 mg/L (008-M004) -MW-8, Round IV and 1.6 mg/L (009-M004) -MW-9, Round IV. Soluble lead analysis indicated that the concentrations of lead are highest in sample 008-M004 (MW-8, Round IV) and were detected at 23 mg/L. In summary, total barium was detected above NJDEP criteria twice in two rounds of sampling (rounds III and IV) in MW-7. Total lead was detected above NJDEP criteria twice in two rounds of sampling (rounds III and IV) in MW-7,

once in two rounds of sampling (Round IV) in MW-8, twice in two rounds of sampling (rounds III and IV) in MW-9, and once in two rounds of sampling (Round III) in MW-10.

Analysis of four rounds of filtered samples for soluble metals analysis identified barium and lead at concentrations above the NJDEP groundwater criteria established for that specific compound's total (unfiltered) metals result. Soluble barium results exceeded the groundwater criteria of 2 mg/l, twice in four rounds (Rounds II and IV) in MW-7. Soluble lead results exceeded 0.01 mg/l twice in four rounds (Rounds I and II) in MW-7, once in four rounds (Round IV) in MW-8, and twice in four rounds (Rounds I and II) in MW-9. Comparison of total and soluble results indicate that the extent of inorganic constituents above NJDEP guidance criteria may be due in part to the presence of fine-grained material or sediment within the total groundwater samples. The assumed elevated total organic carbon levels associated with wetlands may also impact the distribution of barium and lead in this AEC.

During the removal action investigation conducted by Weston in 1995, four groundwater samples were collected to provide current groundwater quality information for Block 25, Lot 1. The analytical results showed that benzene, pentachlorophenol, aluminum, arsenic, cadmium, lead, iron, and manganese were detected at concentrations greater than the NJDEP Class IIA GWQS. Specifically:

- TAL metals were detected at concentrations exceeding the NJDEP Class IIA GWQS in all five groundwater samples analyzed (including one QC duplicate sample). There are no NJDEP groundwater criteria for six of the TAL metals analytes.
 - Aluminum was detected in four of five groundwater samples at concentrations above the NJDEP Class IIA GWQS of 200 ug/L; the highest concentration was detected in background sample MW-10 at 1,200 ug/L.
 - Arsenic was detected in two of five groundwater samples at concentrations above the NJDEP Class IIA GWQS of 8 ug/L; the highest concentration was detected in sample MW-7 at 826 ug/L.
 - Cadmium was detected in one of five groundwater samples at a concentration above the NJDEP Class IIA GWQS of 4 ug/L; the highest (and only) concentration was detected in sample MW-9 at 4.1 ug/L.
 - Iron was detected in all five groundwater samples at concentrations above the NJDEP Class IIA GWQS of 300 ug/L; the highest concentration was detected in sample MW-9 at 5,630 ug/L.

- Lead was detected in two of five groundwater samples at concentrations above the NJDEP Class IIA GWQS of 10.0 ug/L; the highest concentration was detected in sample MW-9 at 112 J ug/L.
- Manganese was detected in two of five groundwater samples at concentrations above the NJDEP Class IIA GWQS of 50.0 ug/L; the highest concentration was detected in background sample MW-8 at 174 ug/L. The results of groundwater TAL metals analyses are presented in Table 3-7.
- One TCL VOC was detected at concentrations above the NJDEP Class IIA GWQS at two of five well locations. Benzene was detected at a concentration above the NJDEP Class IIA GWQS of 1.0 ug/L at MW-7 (2.0 J ug/L) and in sample MW-9 (9.0 J ug/L). The VOC results are presented in Table 3-7.
- One TCL SVOC was detected at a concentration above the NJDEP Class IIA GWQS at one of five well locations. Pentachlorophenol was detected at a concentration above the NJDEP Class IIA GWQS of 1.0 ug/L at MW-7 (5.0 J ug/L). The SVOC results are presented in Table 3-7.
- Groundwater quality parameters were collected from all four of the on site Block 25, Lot 1 monitoring wells. There are no NJDEP groundwater criteria for seven of the analytes. For the five compounds that have NJDEP Class IIA GWQS, all of the compounds were not detected or were detected at concentrations that were lower than the criteria. The water quality results are presented in Table 3-7.

Nature and Extent of Groundwater Contamination

Based on the analytical results presented in the previous section, VOC, SVOC, and metals were detected at concentrations above the NJDEP Class IIA GWQS. The groundwater flow direction in this area of the site (south of Haney Run Brook) is consistently in a north-northwest to northwest direction toward Haney Run Brook. Since wells were not installed in Block 23, Lot 1, groundwater quality information for this area is not available. However, the RI performed just north and west of Block 23, as part of the NJDEP Order, suggests that groundwater in the fenced portion of Block 23 flows in a southerly direction, towards the confluence of White Sand Branch and Haney Run Brook.

Groundwater monitoring began in Block 25, Lot 1 (Former Landfill Area) in 1975. However, only data collected since 1981 are presented in Table 3-7. Sampling prior to 1981 was not performed on a consistent basis or by a consistent party. In addition, the wells monitored prior to the remediation in 1979 had been destroyed during remediation and were subsequently replaced. For these reasons, only post-remediation data have been provided.

- TAL metals analysis of groundwater samples indicated that concentrations of 6 of 23 analytes exceeded criteria. Two of the six analytes, aluminum and iron, are considered to be naturally occurring, based on the fact that they were detected in the background well (MW-10).
- Arsenic was detected at the two downgradient locations, MW-7 (826 ug/L) and MW-9 (16.2 ug/L), at concentrations above the NJDEP Class IIA GWQS of 8.0 ug/L. This exceedance was detected in both downgradient monitoring wells.
- Cadmium was detected at one well, MW-9 (4.1 ug/L), at a concentration just above the NJDEP Class IIA GWQS of 4 ug/L.
- Lead was detected at two locations, MW-7 (32.4 ug/L) and MW-9 (112 J ug/L), at concentrations above the NJDEP Class IIA GWQS of 10.0 ug/L.
- Manganese was detected at two locations, MW-8 (174 ug/L) and MW-9 (69.1 ug/L), at concentrations above the NJDEP Class IIA GWQS of 50 ug/L.
- VOC analysis of groundwater within Block 25, Lot 1 indicated that one compound exceeded the NJDEP Class IIA GWQS. Benzene was detected in two wells, MW-7 (2.0 J ug/L) and MW-9 (9.0 J ug/L), at concentrations above the NJDEP Class IIA GWQS of 1.0 ug/L.
- SVOC analysis of groundwater within Block 25, Lot 1 indicated that one compound exceeded the NJDEP Class IIA GWQS. Pentachlorophenol was detected in one well, MW-7 (5.0 J ug/L), at a concentration above the NJDEP Class IIA GWQS of 1.0 ug/L.

3.2.2 Route 561 Dump Site

A brief discussion of the previous investigations is presented below. This information has been excerpted from US EPA and NJDEP reports and data packages, obtained through FOIA requests.

Figure 3-9 presents the sampling locations and detections above criteria. Figure 3-10 provides a visualization of the vertical distribution of lead analytical results.

The NJDEP began environmental investigations at the site in August 1987. Environmental activities at the site continue until the present. Current activities consist of the maintenance of signs and a fence, around-the-clock electronic surveillance system, designed to limit access to the property, and maintenance of erosion protection measures to prevent soil from entering White Sand Branch.

3.2.2.1 Soil

On 4 August 1987 the NJDEP investigated reports of a failing septic system at the site. Investigative activities reported the presence of a 'heavy odor' in the soils at the site and TCE and PCE contamination above regulatory standards in the septic system from the dry cleaning operation at the site (NJDEP, *Site Investigation, Sherwin-Williams Dump Site, Gibbsboro, Camden County*, Undated). The septic system was eventually (3 February 1993) tied into the Camden County Municipal Utilities Authority. The NJDEP did not investigate the situation further since they stated that the cooling water from the dry cleaning operation was only slightly contaminated.

On 8 February 1993 the NJDEP visited the Site. The results of the NJDEP's February 1993 visit are summarized in a memo dated 24 February 1994 (Sodano, Nicholas, *Investigation of the Sherwin-Williams Dump, Route 561, Gibbsboro*, 24 February, 1994). The NJDEP indicated that they had identified greenish blue material in the soil and in the water at the site. They also noted construction debris such as concrete, re-enforcing bar and creosoted beams. A Gibbsboro resident who accompanied the NJDEP on the inspection contacted the NJDEP Spill Hotline and received an incident identification of 93-2-18-1128-41.

In February 1994, the NJDEP conducted two separate inspections of the property. On 4 February 1994 the NJDEP visited with the then property owner (Mr. Lew Wacker) and gathered background information on the parcel and surrounding parcels. The data collected on the 4 February 1994 visit indicated that the adjacent property (strip mall) had a septic and storm sewer system, which drained directly to the site. Mr. Wacker had an agreement with the developer/owner of the strip mall to permit discharge of waste from the septic system onto his property (the Dump Site) (Sodano, Nicholas, *Investigation of the Sherwin-Williams Dump, Route 561, Gibbsboro*, 4 February, 1994). Current and historical operations at the strip mall have consisted of restaurants, a dry cleaner, a shipping shop and a convenience store.

On 8 February 1994, the NJDEP conducted an inspection of the property, at which time they reportedly identified a "greenish-blue particulate". The NJDEP stated that they had located the material buried underneath the ground surface, atop the ground surface and in the water of the wetland at the site.

On 18 February 1994 the NJDEP visited residences in the area of the site and conducted interviews at 4 residential properties along United States Avenue. The interviews summarized second-hand accounts of the processes and locations of historical disposal activities at the Dump Site and the US Avenue Burn Site (Sodano, Nicholas, *Investigation of the Sherwin-Williams Dump, Route 561, Gibbsboro*, 18 February, 1994).

On 15 June 1994 the NJDEP collected 13 soil samples, including one duplicate, three surface water samples, three sediment samples and one groundwater sample. The samples were analyzed for VOC, SVOC, TAL Metals, cyanide, pesticides and PCBs. A review of the

available information indicates that 6 of the soil samples were collected from the Septic Leach Field and the 7 remaining soil samples were collected from 'waste' material.

Compounds detected above applicable cleanup criteria in the soil were limited to antimony, arsenic, barium, cadmium, chromium, copper and lead (NJDEP, *Site Investigation, Sherwin-Williams Dump Site, Gibbsboro, Camden County*, Undated). The soil samples were located at depths varying from 0 –2.0 ft bgs.

The highest concentrations of the inorganic parameters identified in the soil samples are presented in the table below:

Parameter	Concentration (mg/kg)	Sample ID
Antimony	257	S-1
Arsenic	13,700	S-1
Barium	15,200	S-2
Cadmium	22.9	S-1
Chromium	18,200	S-1
Copper	8,410	S-1
Cyanide	5,160	S-1
Lead	126,000	S-1

From 2 August through 16 August 1995, a US EPA contractor (Ecology and the Environment, Inc.) collected surface and subsurface soil samples from the facility property as well as sediment samples and one surface water sample from the White Sand Branch in order to delineate heavy metal contamination previously identified at the site. Ecology and the Environment, Inc. (E&E) also performed a geophysical survey. According to US EPA the geophysical survey was not successful in identifying a relationship between conductivity readings and contamination. The survey was successful in locating a storm sewer and septic leachate field designed to drain the adjacent strip mall.

Surface and subsurface soil samples were collected by US EPA primarily at the nodes of a 50 ft by 50 ft grid established over the site. Additional soil samples were taken to supplement the grid as necessary. These additional points consisted of the following: five sample points were located north of the site in the grass area between the Continental Plaza parking lot and the site and four surface samples were collected in the grass between the Continental Plaza Parking lot and Route 561. Surface and subsurface soil samples were also collected at six locations adjacent to the east side of Route 561. A sediment sample was collected from the discharge side of the culvert that carries White Sand Branch under Route 561. All soil and sediment samples were analyzed on-site using an X-Ray Fluorescence (XRF) Spectrometer. A total of sixteen (approximately ten percent) of the soil samples were submitted for TAL laboratory analysis to verify calibration of the XRF instrument. Five soil samples were analyzed for TCL analysis and two soil samples for TCLP analysis (Fox, Jeanna, *Action Memorandum to Elliot P. Laws*, 9 September 1996).

The surface soil samples were collected utilizing a pre-decontaminated stainless steel bowl and trowel. A GeoProbe unit was used to collect all subsurface samples.

Analysis of samples collected during the August 1995 sampling event indicated the presence of inorganic contaminants in the on-site soil and downstream sediment samples. The table below presents the maximum concentrations detected from the XRF analysis of soil samples collected at the site.

Analyte	Concentration (mg/kg)
Arsenic	47,512
Barium	44,990
Cadmium	494
Chromium	11,668
Lead	131,504

Three of the four locations where discoloration was observed in the sample matrix exhibited the highest levels of inorganic compounds. The inorganic XRF data for the samples, which had the four highest lead levels, are presented below:

Sample	Lead	Chromium	Arsenic	Zinc
ID	Concentration	Concentration	Concentration	Concentration
45A *	131,504	11,668	33,710	754.71
44A *	95,257	9,329.50	29,148	462.09
35A	57,568	6,461.60	2,240.20	1,331.30
28A *	45,824	5,192.10	245.72	223.19
Notes:				
* - Discoloration observed in soil during sample collection.				
All results reported in mg/kg.				

A total of 25 out of 158 samples submitted for lead analyses by XRF exceeded 1,000 mg/kg.

A total of 16 soil samples, including two duplicates, two water rinsates and three trip blanks were analyzed at an off-site fixed laboratory. The purposes of these samples were to verify the accuracy of the XRF analyses and for additional parameter analyses, which could not be completed using XRF technology. The additional off-site laboratory analyses consisted of the following: volatiles, BNA. Pesticide/PCBs, TAL metals and cyanide and hexavalent chromium. Additionally two soil samples were collected and analyzed for full TCLP parameters and one surface water sample was collected from Clement Lake and analyzed for TAL Metals. Analysis of the samples analyzed for at the off-site laboratory also indicated levels of inorganics were

present at the site. Based on a correlation study performed by US EPA, there was good correlation between the XRF results and the off-site laboratory results. A summary table presenting the chromium, arsenic and zinc results of the four samples with the highest levels of lead is presented below:

Sample ID	Lead Concentration	Chromium Concentration	Arsenic Concentration	Zinc Concentration
3-B	63,200	54 J	5,000	NA R
4-B	194,000	184.00 J	127,000 J	1330
42-B	114,000	88.10 J	7,670.00	431.00 J
44-A	103,000	158.00 J	21100	158 J

No VOC, SVOC, PCB, or pesticide compounds were detected above their minimum detection level (MDL) in any samplers submitted to the off-site laboratory.

The TCLP samples for inorganics indicated lead was present at levels of 126 and 4.7 mg/L in the two samples. The remaining TCLP data indicated that the soils were not hazardous for other compounds.

Additionally, pH readings of the soil and waste samples collected by E&E averaged less than 5.0 standard units and had a low of 2.2 units (Pitruzzello, Vince, *Undated Correspondence to Robert Van Fossen*).

Two sampling events were performed by separate US EPA contractors in September 1995. On 7 September 1995, OHM collected 8 samples consisting of 7 soil samples (including one duplicate sample) and one field blank. On 28 September 1995, an US EPA contractor (E&E) collected six samples (5 sediment, including one duplicate, one rinsate and one trip blank).

During the 7 September 1995 sampling event, OHM collected 8 samples consisting of 7 soil samples (including one duplicate sample) and one field blank. The samples were analyzed for total lead, chromium and arsenic. Lead concentrations observed in the soil samples ranged from 40.9 mg/kg to 714 mg/kg. Chromium concentrations observed in the soil samples ranged from 1.8 mg/kg to 63.1 mg/kg. Arsenic concentrations observed in the soil samples ranged from 1.5 mg/kg to 23.5 mg/kg. Arsenic, chromium and lead were not detected in the field blank.

In September 1995 the US EPA erected a chain link fence and posted warning signs to reduce the potential threat of direct contact. Additionally the US EPA installed silt fence to reduce the amount of contamination that could possibly enter White Sand Branch during overland flow.

In January 1997 waste samples were collected at the Route 561 Dump Site by an US EPA contractor (E&E). The samples were collected and sent to the National Environmental Investigation Center (NEIC) for characterization analyses.

On 12 August 1997 a US EPA contractor (EMI) collected six surface soil samples from an area east of Route 561, north of the existing chain-link fence surrounding the site and west of the Continental Plaza Parking lot. The six soil samples were collected and supplied to Sherwin-Williams consultant (Weston) for analyses. EMI retained one sample for split analyses.

On 12 November 1997 Sherwin-Williams entered into an AOC to perform a Removal Action at the Site. Weston performed all activities associated with this Removal Action on behalf of Sherwin-Williams. The work included consisted of five areas or items. These items were 1) installation of a silt fence, 2) warning signs, 3) site security, 4) barrier fence (to replace US EPA's deteriorated fence) and 5) an impermeable membrane and cover. Warning signs were posted every 100 feet along the newly installed 6-foot chain link fence. Security was provided on-site by a security service until a long-term electronic security system was installed and in operation. The existing silt fence was repaired throughout the site and additional silt fencing was installed as necessary. Three bare areas with significant levels of soil contamination were covered with an impermeable 20-mil thick membrane and revegetated. The all field activities were completed by December 1997. A summary of the removal actions is provided in the Removal Report (Weston, 29 September 1998, Removal Action Report, Route 561 Dump Site, Gibbsboro, NJ).

3.2.2.2 Sediment

From 2 August through 16 August 1995, a US EPA contractor (Ecology and the Environment, Inc.) collected surface and subsurface soil samples from the facility property as well as sediment samples and one surface water sample from the White Sand Branch in order to delineate heavy metal contamination previously identified at the site. A sediment sample was collected from the discharge side of the culvert that carries White Sand Branch under Route 561. All soil and sediment samples were analyzed on-site using an X-Ray Fluorescence (XRF) Spectrometer. Analysis of samples collected during the August 1995 sampling event indicated the presence of inorganic contaminants in the downstream sediment samples.

During a subsequent 28 September 1995 sampling event, E&E collected six samples (5 sediment, including one duplicate, one rinsate and one trip blank). These samples were analyzed for the following: TCL organics, TAL metals and cyanide and hexavalent chromium. One of the sediment samples was rejected due to high moisture content. VOCs were not detected in any of the soil samples, acetone was detected in the field blank. SVOCs, primarily PAH compounds, were detected in one sample (561 SD-2), all SVOC compounds which were detected were

qualified with a J (estimated). A summary of the inorganic results is presented in the table below:

Compound	561SD-1	561SD-1D	561SD-2	561 SD-4
Aluminum	3,280J	3,780J	11,700J	670J
Antimony	UJ	UJ	216J	UJ
Arsenic	66J	88J	6,100J	UJ
Barium	R	R	R	R
Beryllium	UJ	UJ	1J	UJ
Cadmium	UJ	UJ	16J	UJ
Calcium	1,570J	1,880J	7,100J	138J
Chromium	124J	96J	7,960J	6J
Cobalt	UJ	UJ	23J	UJ
Copper	35J	33J	1,360J	3J
Iron	7,170J	9,200J	30,700J	1,590J
Lead	976J	794J	87,100J	13J
Magnesium	151J	197J	2,260J	UJ
Manganese	23J	29J	62J	8J
Mercury	UJ	UJ	UJ	UJ
Nickel	13J	15J	85J	UJ
Potassium	UJ	UJ	1,100J	UJ
Selenium			UJ	UJ
Silver			UJ	UJ
Sodium			R	UJ
Thallium			4J	UJ
Vanadium	15J	14J	45J	4J
Zinc	136J	146J	1,200J	15J
Cyanide	UJ	UJ	868J	UJ
Hexavalent Chromium	7.3 J	8.1 J	309J	UJ

Notes

U - Not Detected.

J - Value is estimated.

Results for sample 561SD-3 were rejected due to moisture content.

Sediment sample 561SD-4 was a background sample collected south of the outfall of Clement Lake, where White Sand Branch meets the elevation of the surrounding wetlands.

Two additional sediment samples were collected during the September 1995 sampling event by E&E. These samples were collected downstream of the Route 561 Dump site in White Sand Branch. Additional discussion of these samples is provided in the White Sand Branch Section.

3.2.2.3 Surface Water

On 15 June 1994 the NJDEP collected 13 soil samples, including one duplicate, three surface water samples, three sediment samples and one groundwater sample. The samples were analyzed for VOC, SVOC, TAL Metals, cyanide, pesticides and PCBs. Lead was reported in the three surface water samples in a range from 3.1 ug/L to 43.6 ug/L. The highest concentration was reported at sample location SW-3 in White Sand Branch just east of the Route 561 Culvert. The concentrations of lead observed in the surface water samples increased from the upstream location (SW-1; 3.1 ug/L) towards the downstream locations (SW-2; 34.4 ug/L and SW-3; 43.6 ug/L).

From 2 August through 16 August 1995, a US EPA contractor (Ecology and the Environment, Inc.) collected surface and subsurface soil samples from the facility property as well as sediment samples and one surface water sample from the White Sand Branch in order to delineate heavy metal contamination previously identified at the site. The surface water sample collected during the August 1995 sampling event indicated that zinc was not detected in the original analysis but was found in the duplicate at a concentration of 25 ug/L. Additionally, one surface water sample was collected from Clement Lake and analyzed for TAL Metals.

3.2.2.4 Groundwater

On 15 June 1994 the NJDEP collected 13 soil samples, including one duplicate, three surface water samples, three sediment samples and one groundwater sample. The samples were analyzed for VOC, SVOC, TAL Metals, cyanide, pesticides and PCBs.

Compounds detected above applicable cleanup criteria in the groundwater were limited to arsenic, barium, chromium, copper and lead (NJDEP, *Site Investigation, Sherwin-Williams Dump Site, Gibbsboro, Camden County*, Undated). The inorganic results of the groundwater sample are presented in the table below:

Parameter	Concentration (ug/L)
Arsenic	3,790
Barium	6,970
Cadmium	14
Chromium	2,520
Copper	2,960
Nickel	1,440
Lead	37,200

Parameter	Concentration (ug/L)
Vanadium	814
Zinc	2,730

The NJDEP groundwater sample was a grab sample collected from a temporary well point. A groundwater sample collected by the NJDEP during an alternate investigation from a neighboring residential well (3 Kresson Road, see Table 3-1) did not indicate the presence of any contamination in excess of groundwater quality standards. The residential well sampling results are provided in Appendix E.

3.2.3 White Sand Branch

A brief discussion of the previous investigations is presented below. Information has largely been excerpted from reports previously submitted to US EPA or NJDEP, with little or no editing.

Figure 3-6 presents the sampling locations and detections above criteria. Figure 3-7 provides a visualization of the vertical distribution of lead analytical results.

3.2.3.1 Sediment

NJDEP conducted an SI in the United States Avenue Burn site and nearby areas on 20 May 1994. Four sediment samples were collected along White Sand Branch: SED-3 (upstream), SED-4, SED-5 and SED-6 (downstream, in the basin before United States Avenue). Since TOC measurements were not collected, the Ontario SSLs were utilized as the criterion for comparison. Arsenic was detected above the 33 mg/kg level in SED-3 (78.2 mg/kg) and SED-6 (235 mg/kg), iron was detected above the 40,000 mg/kg SSL in SED-6 (62,100 mg/kg) and lead was detected above the 250 mg/kg SSL in SED-3 (513 mg/kg) and SED-6 (2,510 mg/kg). Generally, metal concentrations in sample SED-6 were approximately one order of magnitude higher than the other three samples. However, SED-6 was collected in a depositional area, where sediments accumulate over time, while the other samples were collected from areas that are subject to periodic scouring. A limited number of VOC and SVOC compounds were detected in these samples, at concentrations less than 1 mg/kg, and below the SLL levels. 4,4'-DDD was detected in SED-3 (0.035P mg/kg) SED-4 (0.041 mg/kg) and SED-6 (0.015P mg/kg). Alpha-chlordane was also detected in SED-4 (0.0061g/kg). No other pesticides were detected. No PCBs were detected in any of the samples.

During the removal action investigation performed by Weston from November 1995 through December 1996 on behalf of Sherwin-Williams at the United States Burn site (and related areas including White Sand Branch), several sediment and surface water samples were collected from White Sand Branch. Analytical results of sediment samples collected from White Sand Branch during the Weston investigation indicated that seven metals (arsenic, cadmium, copper, lead, mercury, thallium, and zinc) were detected at concentrations greater than the conservative Ontario

LEL guideline for protection of freshwater biota; only lead and arsenic levels exceeded the Ontario SEL guideline.

A detailed discussion of Sherwin Williams' 1995 sediment sampling program was presented in Section 3.2.1.2 and 3.2.2.2.

In August 1995, a US EPA contractor collected sediment samples from the White Sand Branch. Analysis of these samples indicated the presence of inorganic contaminants in the on site soil and downstream sediment samples (US EPA, March 1998).

In September 1995, a US EPA contractor collected several sediment samples including two along White Sand Branch. The sample collected furthest downstream contained 976 mg/kg lead (a duplicate sample contained 794 mg/kg lead), while the sample collected closer to the Route 561 Dump site contained 87,100 mg/kg lead.

3.2.3.2 Surface Water

NJDEP conducted SI activities in the White Sand Branch area on 20 May 1994. During this investigation, surface water samples were collected from White Sand Branch. Arsenic, lead and zinc were detected in concentrations above NJDEP FW-2 class surface water quality standards. Of the VOCs, only methylene chloride was detected in one sample. Of the SVOCs, bis (2-ethylhexyl) phthalate was detected in SW-3 and naphthalene in SW-4. No other VOCs or SVOCs were detected. No pesticides or PCBs were detected in any of the samples. The results of three surface water samples collected in the vicinity of the Route 561 Dump Site by NJDEP in June 1994 are discussed above under Section 3.2.2.3.

A detailed discussion of Sherwin-Williams' and US EPA's 1995 surface water sampling program were presented in Section 3.2.1.3 and 3.2.2.3.

3.2.4 Haney Run Brook

A brief discussion of the previous investigations is presented below. Information has largely been excerpted from reports previously submitted to US EPA or NJDEP, with little or no editing.

Figure 3-6 presents the sampling locations and detections above criteria. Figure 3-7 provides a visualization of the vertical distribution of lead analytical results.

3.2.4.1 Sediment

NJDEP conducted an SI in the United States Avenue Burn site and nearby areas on 20 May 1994. Two samples SED-1 (upstream) and SED-2 (downstream) were collected. Since TOC measurements were not collected, the Ontario SSLs were utilized as the criterion for comparison. None of the metals were detected in concentrations above the SSLs. Methylene chloride (qualified “BJ” in sample SED-1) and bis (2-ethylhexyl) phthalate was detected in both samples. No other VOCs or SVOCs were detected. Various SVOC TICs were detected but were mostly listed as ‘unknown’. However, many of the TICs for which a name was provided are fatty acids. No pesticides or PCBs were detected in any of the samples.

During the removal action investigation performed by Weston from November 1995 through December 1996 on behalf of Sherwin-Williams at the United States Burn site (and related areas including White Sand Branch), several samples were collected from Haney Run Branch. Analytical results of sediment samples collected from White Sand Branch during the Weston investigation indicated that seven metals (arsenic, cadmium, copper, lead, mercury, thallium, and zinc) were detected at concentrations greater than the conservative Ontario LEL guideline for protection of freshwater biota; only lead and arsenic levels exceeded the Ontario SEL guideline.

In August 1995, a US EPA contractor collected sediment samples from the Haney Run Branch. Analysis of these samples indicated the presence of inorganic contaminants in the on site soil and downstream sediment samples (US EPA, March 1998).

A more detailed discussion of Sherwin-Williams’ 1995 sediment sampling program was presented in Section 3.2.1.2

3.2.4.2 Surface Water

NJDEP conducted SI activities in the Haney Run area on 20 May 1994. During this investigation, two surface water samples were collected from Haney Run Brook. Lead and zinc were detected in concentrations above NJDEP FW-2 class surface water quality standards. Of the VOCs, only methylene chloride was detected in sample SW-1, but it was qualified as “B” due to laboratory contamination. No other VOCs were detected. No SVOCs, pesticides or PCBs were detected in any of the samples.

A more detailed discussion of Sherwin-Williams' 1995 surface water sampling program was presented in Section 3.2.1.3

3.2.5 Bridgewood Lake

A brief discussion of the previous investigations is presented below. Information has largely been excerpted from reports previously submitted to US EPA or NJDEP, with little or no editing.

Figure 3-6 presents the sampling locations and detections above criteria. Figure 3-7 provides a visualization of the vertical distribution of lead analytical results.

3.2.5.1 Sediment

Sediment samples were collected during the United States Avenue Burn site investigation by Weston from five locations within and at the edge of Bridgewood Lake. Two sediment samples (SD-12A and SD-13A) collected from within the lake had lead concentrations of 1,420 mg/kg and 1,360 mg/kg, respectively.

At location SD-09 (within Bridgewood Lake), several SVOCs were detected at concentrations above their respective Ontario LEL values, including benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, chrysene, dibenz(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, and pyrene. The SVOCs detected may be attributable to roadway runoff or runoff from the adjacent railroad tracks.

3.2.5.2 Surface Water

Surface water samples were not collected at Bridgewood Lake.

3.2.6 Hilliard Creek

The portion of Hilliard Creek east of W. Clementon Road was investigated by Sherwin-Williams as part of The Paint Works, under NJDEP oversight. US EPA also conducted a screening investigation in 1999. The portion of Hilliard Creek west of W. Clementon Road was investigated initially by US EPA and subsequently by Sherwin-Williams under US EPA oversight. These investigations are summarized below.

Figure 3-11 presents the sampling locations and detections above criteria. Figure 3-12 provides a visualization of the vertical distribution of lead analytical results.

3.2.6.1 East Of W. Clementon Road

3.2.6.1.1 Soil

Potentially contaminated groundwater seeps were observed in the parking area (Seep Area) near the Gibbsboro Police Station (also referenced as former building 50 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figure 2-4) and former Academy Paints building (also referenced as former building 67 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4) in the 1980s. In response to an NJDEP directive to contain the groundwater seeps, Scarborough retained Kaselaan & D'Angelo Associates, Inc. (Kaselaan & D'Angelo) to conduct a subsurface investigation in the area of the former Academy Paints facility (former Bldg. 67).

During that preliminary sampling effort, two samples were collected. The first sample was collected from the material emanating from a seep along Hilliard Creek, immediately west of the Police Station. The second was a soil sample collected from below the bituminous layer of the parking lot north of the former Academy Paints facility. This soil sample location also corresponded to the second seep location, which is immediately west of the intersection of Foster Avenue and United States Avenue. Analytical results of these two samples showed that hydrocarbon substances were present in each sample.

Following the preliminary sampling effort, a subsurface investigation was conducted by Scarborough in 1988 on the land surrounding the parking lot and stream bank around the perimeter of the former Academy Paints facility. Scarborough retained Kaselaan & D'Angelo to conduct the investigation. Soil borings were drilled from Foster Avenue south to the former lagoon area and from United States Avenue west across the branch of Hilliard Creek. According to the Kaselaan & D'Angelo investigation report, samples collected east of the facility contained the highest levels of total petroleum hydrocarbons (TPH) and volatile organic compounds (VOCs). The highest concentrations were detected in a sample located immediately west of the intersection of Foster Avenue and United States Avenue, in the vicinity of the second seep. Samples collected adjacent to the creek contained concentrations of TPH, cyanide, and metals. Concentrations of these compounds and analytes were also detected in samples collected south of the former Academy Paints facility. Aqueous samples were collected from three of the borings, and analytical results indicated potential groundwater contamination (Appendix C).

The Kaselaan & D'Angelo investigation confirmed the presence of VOCs, TPH, and metals in the soils. The results of an electromagnetic survey identified areas of elevated terrain conductivity, suggesting subsurface contaminant plumes in the vicinity of the former Academy Paints facility. The groundwater flow direction was not established at that time. Furthermore, the potential source or potential contaminant migration pathways were not confirmed.

Scarborough began remedial measures in 1987 to prevent the contaminated seeps from entering Hilliard Creek. Oil-absorbent booms and filter fences were installed in the area surrounding the seep located northeast of the former Academy Paints facility and at the rip-rap channel and storm

water conveyance to collect free-phase product. The rip-rap channel is where surface water generated within the parking lot north of the former Academy Paints facility drains to Hilliard Creek. NJDEP also requested that both structures be pumped out on an as-needed basis. As of August 1987 Casie Ecology Oil Salvage, an emergency response contractor, had pumped out approximately 4,200 gallons of seep material.

Following the installation of the oil-absorbent booms and filter fence, Kaselaan & D'Angelo proposed several options to Scarborough to manage the seep material. The Paint Works personnel constructed a berm around the Seep Area in the parking lot of the former Academy Paints facility. Kaselaan & D'Angelo personnel monitored this area on a daily basis using an oil-absorbent material to soak up the product. The absorbent material was then shoveled into 55-gallon drums and disposed of.

To keep the seep adjacent to the creek from entering the surface water, Kaselaan & D'Angelo constructed temporary bypass piping of Hilliard Creek past the location where the leachate emanated from the streambed. Initially, 3-foot-diameter concrete pipe sections were laid along the streambed. Once they were in place, a concrete headwall was constructed approximately 35 feet south of Foster Avenue. The headwall was constructed in a position that allowed for storm water to be retained in an area upgradient of the headwall. The area was then backfilled with clean sand and clay.

In addition to the berm and bypass of Hilliard Creek, Kaselaan & D'Angelo constructed a bulkhead around the perimeter of the stream bank. An 8-foot by 40-foot wooden enclosure was assembled on site. The interior walls were lined with an impervious plastic liner, and the lower halves of the walls were packed with clay and shaped to direct precipitation toward the center of the structure. Once complete, the exterior of the structure was backfilled with clay. The installation of the bulkhead around the perimeter of the stream bank seep reportedly succeeded in stopping the product from entering surface waters. In addition, the bulkhead acted as a void, allowing the product to flow to the center of this area. Both the berm in the parking lot and the bulkhead around the stream bank were reportedly designed to contain any migration of the seeps. The structure along the creek was removed in September 1996 as part of the Police Station (also referenced as building 50 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figure 2-4) remedial effort. The structure located in the parking lot remains in place to date.

These early investigations and observations suggested that the free-phase product had several potential migration pathways:

- Upward migration through the parking lot macadam, which led to discharges to the storm water sewer;
- It is plausible that the free-phase product may have seeped directly into the storm water sewer system; and
- There was a potential for discharges to the creek from the storm sewer system and the seep located adjacent to the creek, behind the Police Station (former building 50).

The migration of the free-phase product was addressed by Sherwin-Williams in later investigations and remedial activities, which are reported in later sections.

3.2.6.1.2 Remedial Activities At The Seep Area

Free-phase product was removed from a storm sewer system located in the Seep Area in May 1994 and July 1995. It appeared that during times of high water table, free-phase product present at the water table interface entered the storm sewer system. Due to the potential for repeated seepage of product into the system and associated health risks, the NJDEP identified the Seep Area as an IEC. To select an appropriate remedial action, a Focused FS was conducted. Based on the results of this Focused FS, Sherwin-Williams identified the most appropriate remedial action as a combination of the following components:

1. Excavation and replacement of the leaky portion of the storm sewer with a sealed system to prevent infiltration of free-phase product.

To control infiltration of free-phase product into the storm sewer, the existing structure was removed and a new, water-tight one was installed. The portion of the storm sewer pipe that was replaced was located within the free-phase product plume associated with the former Academy Paints Seep Area. This leaking section was replaced with a leak-tight inlet box and PVC pipe in to prevent product from entering the storm sewer system.

2. Excavation and off site recycling of contaminated soils from the Police Station (former Building 50) Seep Area located adjacent to the Police Station.

On 30 January 1996, Sally Jones, Weston Project Manager, observed on the ground the presence of a fresh oil-like substance approximately 20 feet immediately west of the Police Station building (also referenced as former building 50 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figure 2-4), among a grouping of trees. The oil-like substance was immediately adjacent to the stained area that has been the focus of the investigation. Immediately after making this observation, Ms. Jones contacted the NJDEP Case Manager and explained her observations. After discussion, it was agreed that Weston should

report the discharge to the NJDEP spill hot line. Within a few hours of identifying the release, Weston reported the incident to the hot line, and Case Number 96-1-30-1422-02 was assigned. Later that day, Weston performed test borings around the spill with a hand auger to determine the extent of the spill and to determine whether it was associated with the existing groundwater/soil contamination. Sherwin-Williams and Weston believe, contrary to NJDEP, that the results of the hand augering confirmed that the free-phase product observed that day on the ground surface was indeed a recent spill and not a result of seeps from the adjacent stained area because the spill attenuated with depth. The spill was black in color and had the consistency of waste oil. Weston estimated that 5-10 gallons of oil had been released. At the time of the discharge, Sherwin-Williams neither owned nor operated the property.

At the request of NJDEP, Weston collected a soil sample (PS-01) from the contaminated, stained soil behind the Police Station prior to implementing soil removal as per the Immediate Environmental Concern Remedial Action Work Plan. The purpose of the sampling was to determine the most appropriate post-excavation confirmatory sampling parameters. The sample (and one additional sample - DSP-1) was collected on 21 February 1996 from the most heavily stained soils behind the Police Station. Soil sample PS-01 contained over 13,000 ppm of total petroleum hydrocarbons and 64 mg/kg of xylenes.

In September 1996 Sherwin-Williams conducted a remedial action to address contaminated soils behind the Police Station. The work was documented in the Remedial Action Report, Police Station Area and Storm Sewer Replacement prepared by Weston and submitted to NJDEP on June 15, 1998. A summary of activities is presented below.

The 40-foot long, 10-foot across and 2.5-foot-high wooden structure installed by Scarborough in 1987 was uncovered. The water in the structure was pumped out using a vacuum truck. The structure was then demolished and placed in a roll-off for off site disposal. The soil from within and east of the wooden structure was excavated using a Caterpillar 215 track hoe. A 10-cubic-yard dump truck was used to transport 50 cubic yards of excavated soil from the seep area to the dewatering pad. During excavation activities it was observed that groundwater with a mixture of water and free-phase product was entering the excavation from the east. Since the source of this mixture had not been identified, it was determined that continuing to excavate would not sufficiently remediate the impacted soils in this area. Two soil samples were collected and field-screened using immunoassay methods. The field screening results indicated concentration <2.5 ppm suggesting that "clean" soils had been reached. The excavation was backfilled with crushed stone and covered with topsoil and seeded.

To identify potential sources for the observed mixture of water and free-phase product, the Caterpillar 215 track hoe was used to dig a trench in order to find any features that may be acting as a conduit for product to enter this area from beneath the parking lot south east of the Police Station. A 4-inch PVC pipe was located in the middle of the west side of the Police Station. The pipe is 3 feet BGS and is running westward direction away from the Police Station. The PVC

pipe appears to be associated with the floor and roof drainage system for the Police Station. No product was encountered while uncovering this pipe.

A 6-inch terra-cotta pipe leading from The Paint Works maintenance shop, west toward Hilliard Creek, was also uncovered. The pipe end was encountered approximately 3 feet below ground surface and extended approximately 10 feet from the building. Weston carefully exposed the end of the pipe. The pipe terminated abruptly and no french drain or sump was found at its terminus. Free-phase product was present in the interior of the pipe, and it appeared to be waste oil. The NJDEP disagreed with Weston's assessment and believed it appeared to be the same material noted in the parking lot seep. Weston recorded these findings on videotape. Weston removed the free-phase product from the pipe and backfilled the area. The pipe remains intact to date.

At the southern end of the excavation, at the location of the former Academy Paint aboveground storage tanks, free-phase product was observed entering the excavation. Two 6,000-gallon vertical steel aboveground tanks were previously located in this area. The contents were mineral spirits 66-2 and 802-15 alkyd resin. Based on Weston's observations, the area beneath the concrete structure is a source area which is contributing to the localized soil and groundwater contamination west of the Police Station building and Hilliard Creek.

Upon completion the trench was backfilled with the excavated soils.

A vacuum truck was used to remove liquid waste from the wooden structure and the storm sewer excavation. The waste that was generated was classified as an NJDEP ID-72 Non Hazardous Liquid, water and oil mixture. A total of 13,910 gallons were brought to Republic Environmental Recycling, Inc., in Clayton, New Jersey for disposal.

During excavation activities, 66 tons of soil was excavated and staged on the dewatering pad. The soil was disposed non-hazardous at the Clean Earth, Maryland facility.

- 3. SVE with three passive skimmers in the former Academy Paints (former building 67) Seep Area. Automated skimmers were installed in the areas of thickest free-phase product (primarily along United States Avenue) to recover mobile product as rapidly as possible. The location of these skimmers was adjusted over the course of the remediation to correspond to the thickest zone of free-phase product. SVE vents were installed throughout the Seep Area to remove free-phase product. Product captured by the skimmer system is disposed of off site at a permitted facility, while vapor-phase product in the SVE off gas is treated by thermal oxidation.**

Construction activity for the FPR/SVE system began with installation of vertical SVE vents by the drilling contractor under Weston oversight. This work was completed between 29 and 31

July 1997. Vertical SVE vent construction was completed with no significant problems or changes to the design.

Construction of horizontal SVE vents and belowground ductwork and piping was conducted by Republic during the period 20 August to 26 September 1997. In general, construction proceeded as planned. Minor relocation of site components, including adjustments to the alignment of the horizontal SVE trenches, was found appropriate to provide the desired coverage in the parking lot area. Figure 3-13 provides the system layout. All vents were surveyed by a licensed surveyor.

The aboveground collection and treatment system consisting of a free-phase product collection and holding tank and the SVE/Thermal Oxidizer skid was installed during the period 24 November 1997 to 26 November 1997. During the startup phase (discussed below), a stockade fence was constructed around the treatment area to provide site security and visual screening from the nearby community. Additional esthetic improvements, including planting of shrubbery around FPR/SVE risers have been conducted in accordance with conditions in the Site Plan Approval.

To date, over 3,785 gallons of free product have been recovered. The most recent system progress report was submitted to NJDEP in July 2001.

- 4. A manual passive skimmer was installed at MW-11 to recover free-phase product. This product is combined with that from the Academy Paints (former building 67) Seep Area for off site disposal.**

3.2.6.1.3 Sediment

A total of seven sediment samples were collected and analyzed from Hilliard Creek, between Foster Avenue and Clementon Road (during the period from December 1991 through October 1996 as part of the Remedial Investigation conducted by Sherwin-Williams for the Paint Works Corporate Center Site under NJDEP oversight). The compounds that were consistently detected in sediment were metals and base/neutral compounds (di-n-butyl phthalate, bis(2-ethylhexyl)phthalate, benzo(g,h,i)perylene, acenaphthene, anthracene, benzo(a)pyrene, fluorene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene).

A comparison of sediment contaminant concentrations to the Ontario Provincial Guidelines revealed that concentrations of PAH compounds and lead exceeded the Ontario Provincial LEL guideline at all seven locations sampled. Additional exceedances of the LEL guideline were noted for arsenic, cadmium, chromium, copper, and zinc at scattered locations. However, the SEL guideline was exceeded only at location SSW-09 for PAH compounds. This location is a

depositional area; upstream of that location, Hilliard Creek is narrowly channelized (Weston, Feb. 1998).

Of the locations exhibiting LEL exceedances, SED-09 had the highest contaminant concentrations. At this location, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, phenanthrene, and pyrene were detected above the Ontario LELs, which are a very conservative measure of potential risk. Most of these compounds were also detected in 001-SD01 (sampling location SSW-01), 001-SD11 (SSW-01), 002-SD01 (SSW-02), 003-SD01 (SSW-04), and 006-S002 (SSW-06), although at lower concentrations. Some of the above compounds were also detected in SSW-03 and SSW-05, at concentrations close to the LEL. Metal LEL exceedances were detected in samples 004-S002, 005-S002, and SED-09. In samples 001-SD01, 001-SD11, 002-SD01, 003-SD01, only lead exceeded the LEL (Weston, Feb. 1998).

The highest concentrations of PAHs detected in sediment were at location SSW-09. A review of nearby groundwater data from wells MW-6, MW-13, MW-14, MW-16, and MW-17 revealed that PAHs were undetected in groundwater. The source of lead and PAH compounds in sediments is potentially related to soil contamination within the area, and also road and parking lot runoff related to storm runoff. For example, a review of surficial and sub-surficial soil results in the vicinity of SSW-09, where the SEL guideline was exceeded for PAHs, indicates that several of the same PAH compounds detected in sediments are present in nearby soils (Weston, Feb. 1998).

Specifically, at SSW-09, concentrations of anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and others exceeded the LEL guideline, with individual PAH concentrations ranging from 6.1 to 31 mg/kg. These compounds were not detected in the wells located nearest to SSW-09. However, several of the same compounds were detected in surficial soils at the four locations nearest to SSW-09 (TB-69, TB-73, MW-17, and MW-18). Concentrations of these individual PAH compounds in soil at these locations ranged from "not detected" to 0.53J mg/kg. In addition, PAH compounds were detected in soils behind the Police Station (former building 50) at location PS-01. Concentrations of individual PAH compounds ranged from 1.3J to 8.8J mg/kg at that location (Weston, Feb. 1998).

Metals concentrations in sediment may pose a potential ecological risk, as lead concentrations exceeded the Ontario LEL guidelines at all locations sampled, and scattered concentrations exceed guidelines for other metals.

In summary, a comparison with screening criteria/guidelines indicates that the concentrations of PAHs and metals detected in the sediments of Hilliard Creek pose potential ecological risks that may warrant further investigation in an ecological risk assessment (Weston, Feb. 1998).

Based on a 20 August 1998 referral from the NJDEP, the US EPA conducted sampling along Hilliard Creek in September 1998. The NJDEP requested in its August 20, 1998 letter that the US EPA sample, characterize, and dispose of all hazardous substances found at the Site in such a way as to safeguard the local population. Analytical results indicated the presence of hazardous substances in the stream sediments collected adjacent in and adjacent to Hilliard Creek.

3.2.6.1.4 Surface Water

Between December 1991 and October 1996 Sherwin-Williams collected seven surface water samples from Hilliard Creek, between Foster Avenue and Clementon Road, under NJDEP oversight. An eighth sample (004-SW01) was collected in Silver Lake in 1991. The compounds that were consistently detected were metals and methylene chloride. Methylene chloride, however, was detected in the laboratory blank of each sample analyzed, including the sample collected in Silver Lake. (Weston, Feb. 1998).

Since the above investigations were conducted either by or under the oversight of the NJDEP the State of New Jersey FW2 standards were utilized. During preparation of this work plan, the Federal Criteria for Maximum Concentration (CMC) were substituted (e.g. Tables 3-6, 3-10, & 3-14). This was done for the purpose of preserving the integrity of the original documents, which were prepared and submitted under a different regulatory program. Therefore, these comparisons are not being used to determine overall surface water quality exceedances with respect to conclusions that will need to be drawn for the RI/FS for the sites since all FW2 classified waters in the State of New Jersey must meet the Criteria of the Federal Toxic Rule as shown in 40 CFR Part 131 Subpart D Federal Promulgated Water Quality Standards Chapter 1. The latest New Jersey Water Quality Standards NJAC 7:9B Standards are only used for the FW2 exceptions referenced in 40 CFR §131.36 (d)(3)(ii), and if the New Jersey State Criteria for any specific substance is more stringent than the Federal Toxic Rule criteria. Further, the Federal Surface Water Quality Metals Criteria from the Toxic Rule is based on a calculation of ambient total hardness in mg/L to determine the dissolved form metals criteria. Surface water total hardness data will be collected as part of this RI/FS and will assist in properly defining surface water quality exceedances in all subsequent documents to be submitted as part of this RI/FS. Discussions of existing analytical results in these surface water sections are provided for informational purposes only and as a screening tool to assist in identifying potential areas of concern.

A comparison of surface water quality standards to US EPA chronic freshwater ambient water quality criteria as a screening measure of potential ecological risks revealed that concentrations of lead, copper, and iron exceed the criteria.

Lead exceeded the US EPA chronic criterion of 3.2 µg/L at five locations sampled, with exceedance concentrations ranging from 3.5 to 65.5 micrograms per liter (µg/L). The lead

concentration upstream in Silver Lake was "non-detect" at the single location sampled; copper, iron, and zinc were not analyzed for at that location.

Copper exceeded the US EPA chronic criterion of 12 µg/L at one location (SSW-05) where the concentration was 14.8 µg/L. Zinc equaled the criterion of 110 µg/L at one location (SSW-05). Copper and zinc data were unavailable (rejected) for the two upstream samples collected in Haney Run Brook. Iron was detected above the US EPA chronic criterion at SSW-4 (1,520 µg/L), SSW-5 (17,900 µg/L), SSW-6 (3,790 µg/L), SSW-09 (2,520 µg/L). It is Sherwin-Williams opinion that since soils in the area are iron-rich, these concentrations may be reflective of natural conditions. However, since the final location of background samples, and the collection and analysis of these samples, have not been determined at the writing of the Work Plan, the potential source (e.g., natural or past disposal practices) has not been concluded by US EPA.

A comparison of the surface water data to NJDEP FW-2 water quality standards revealed that benzene (6 ug/L at location SSW-09) and some PAHs (chrysene (1 ug/L (est.)), benzo(a)pyrene (1ug/L (est.)), and indeno(1,2,3-cd)pyrene) (1ug/L (est.)) at location SSW-06 exceeded the NJDEP FW-2 standard, which is based upon carcinogenic health risks for these compounds. Remaining exceedances of NJDEP FW-2 standards in Hilliard Creek (e.g., lead (exceedances ranging from 8 to 65.5 ug/L), arsenic (exceedances ranging from 12.4 to 89 ug/L)) represent potential human health risks from ingestion of surface water.

3.2.6.2 West Of W. Clementon Road

Several investigations have been performed at the Hilliard Creek Site, west of W. Clementon Road. Environmental sampling began in June 1998 and has continued until present (November 2001). This report incorporate results up to April 2000. Separate investigations have been performed by the NJDEP, the US EPA and Sherwin-Williams. All Sherwin-Williams investigations were performed under US EPA oversight. A summary of the investigations completed through April 2000 are presented below.

3.2.6.2.1 DEP Investigation

In June 1998 a consulting firm (Advanced GeoServices Corporation) working in conjunction with NJDEP and representatives from Buzby Landfill, collected sediment samples from a section of Hilliard Creek located in the Hilliard Creek Wildlife Refuge. The purpose of the sampling event was to obtain background samples for another site (i.e., the Buzby Landfill site located approximately one mile north of the former paint manufacturing plant currently known as the Paint Works Corporate Center). The sediment sample results indicated that elevated levels of lead, chromium, arsenic and zinc were present in the sediments. With respect to lead, sample concentrations ranged from 68,000 ppm to 220,000 ppm. Limited sampling was also conducted for organic contaminants and detected fluorene, phenanthrene, anthracene, fluoranthene, pyrene,

benzo(a)anthracene, chrysene, benzo(a)pyrene, and benzo(g,h,i)perylene concentrations in the sediment samples as high as 0.31 ppm (estimated), 2.8 ppm, 0.8 ppm (estimated), 5.7 ppm, 5.3 ppm, 2.7 ppm, 3.6 ppm, 3.2 ppm, and 1.2 ppm (estimated), respectively, exceeding Ontario lowest effects level (LEL). Also, other inorganics detected in the sediment sample with the lead concentration of 220,000 ppm (i.e., sediment sample # SD-7-3) consisted of chromium, arsenic, cadmium, copper, mercury, and zinc in concentrations at 13,000 ppm, 1,110 ppm, 31.7 ppm, 139 ppm, 5.4 ppm, and 4,380 ppm, respectively, exceeding Ontario LEL. Due to the elevated levels of contaminants observed during their investigation, the consulting firm forwarded their information to the NJDEP for review.

In a letter dated 20 August 1998, the NJDEP referred the site to the US EPA, stating that they are requesting the site to be considered for removal action eligibility. The NJDEP requested in their August 20, 1998 letter that the US EPA sample, characterize, and dispose of all hazardous substances found at the Site in such a way as to safeguard the local population.

3.2.6.2.2 US EPA August/September 1998 Investigation

On 28 August 1998 the US EPA performed a site reconnaissance. The reconnaissance was conducted to identify locations at the Hilliard's Creek Site where the June 1998 samples were collected and to visually inspect the site. According to the US EPA, the site reconnaissance identified blue material in the banks of Hilliard Creek within the wildlife preserve. Based on the 28 August 1998 reconnaissance, the US EPA selected three locations for additional sampling.

On 8 September 1998 the three above referenced locations were sampled and analyzed for TCL and TAL parameters, plus cyanide. The sampling locations were placed upstream, downstream and one in the area of a contaminated sample collected during the June 1998 investigation. Results of this investigation indicated that arsenic, barium, cadmium, chromium, lead, copper, mercury, chrysene, and zinc were present at elevated concentrations at the site. Results of this investigation indicated copper, mercury, and silver concentrations were as high as, 155 ppm (estimated), 7.3 ppm (estimated), and 1.7 ppm (estimated), respectively, exceeding Ontario LEL. No significant concentrations of organic compounds were detected in the samples with the exception of chrysene (concentration 0.39 ppm (estimated)), which exceeded the Ontario LEL (TetraTech EMI, Final Sampling Plan, Hilliard's Creek Site, 5 November 1998). However, analysis for tentatively identified compounds revealed the presence of unknown cycloalanes in the samples. A summary of the most significant metal detections is provided below with arsenic, cadmium, chromium, lead, and zinc concentrations detected at levels exceeding Ontario Severe Effect Level (SEL):

Compound	Concentration
Arsenic	427
Barium	12,000
Cadmium	26.4

Chromium	12,800
Lead	134,000
Zinc	3,190 J

Notes:

All results reported in mg/kg.

J – Estimated

3.2.6.2.3 US EPA November 1998 Investigation.

In November 1998 the US EPA contracted Tetra Tech EM, Inc. (Tetra Tech) to conduct sampling screening sampling along Hilliard Creek between Silver Lake and Hilliard Road. The scope of work called for the collection of samples from Hilliard Creek, Silver Lake, Bridgewood Lake and an unnamed tributary draining Bridgewood Lake.

Generally, samples were collected at 50 foot transects upstream of Hilliards Road to Silver Lake (an approximate distance of 4,600 feet). A total of 92 transects were established. At each location (transect) three borings were drilled. These three borings consisted of a northern bank location, a center stream location and a southern bank location. This sampling approach was also utilized along the small creek draining the man-made pond and the unnamed creek draining Bridgewood Lake. At select transects, additional borings were installed along the northern and southern banks of the creek at distances 7 and 12 feet from the center of the creek. (Figures 3-11 and 3-12.)

During the November 1998 investigation, 676 sediment samples, 42 soil samples, eight aqueous samples and three suspected waste samples were collected on site and analyzed for lead while two of the water samples and three of the sediment samples were analyzed for VOCs, SVOCs, Pesticides, and PCBs. Further, seven of the water samples, two of the sediment samples, and the three waste samples were analyzed for TAL metals and seven of the water samples and one of the sediment samples were analyzed for total cyanide. Lastly, five of the water samples were analyzed for hexavalent chromium.

Soil and sediment samples were field analyzed utilizing XRF for lead. 437 samples exceeded the 400 mg/kg criterion for lead. 17 of these samples had lead concentrations ranging from 80,000-140,000 mg/kg. Two soil samples were collected from the southern side of Hilliard Creek and submitted for TCL analyses. These two soil samples exhibited elevated levels of methylene chloride, acetone, carbon disulfide and some SVOCs (mainly PAH compounds). Cyanide was also detected in one of these two soil samples.

Three waste samples were submitted for analysis. Each waste sample was analyzed for TAL metals and TCLP RCRA metals analyses. All three samples had significant levels of metal contamination. Sample # W-1 was RCRA hazardous for lead. Lead was detected at 362 mg/L in

the leachate. The sample was not considered RCRA hazardous for any other compound. The TAL metals analysis of W-1 revealed significant concentrations of aluminum (12,400 mg/kg), arsenic (759 mg/kg), barium (2,870 mg/kg), chromium (19,800 mg/kg), zinc (2,540 mg/kg) and lead (65,000 mg/kg) with all of the aforementioned contaminants (with the exception of aluminum which has no level established) exceeding the NJDEP residential soil cleanup criteria. The remaining two waste samples were not considered RCRA hazardous based on their TCLP results. The TAL metals results from these other two waste samples (WPH1 and WPH2) indicated significant concentrations of some metals as well. The analysis of WPH1 revealed concentrations of barium (14,400 mg/kg), copper (1,360 mg/kg), lead (998 mg/kg), thallium (2.56 mg/kg), and zinc (4,840 mg/kg) exceeding NJDEP residential soil cleanup criteria. The analysis of WPH2 revealed concentrations of barium (13,100 mg/kg), copper (855 mg/kg), lead (1,090 mg/kg), mercury (17.8 mg/kg), thallium (2.12 mg/kg), and zinc (5,270 mg/kg) exceeding NJDEP residential soil cleanup criteria.

Sediment samples from Bridgewood Lake did not reveal significant concentrations of lead. However, one sediment sample collected from Silver Lake indicated significant concentrations of acetone, and several SVOCs, pesticides and Arochlor-1260 (PCB) were present. This sediment sample (SL-SD-2) was taken near the southwestern end of the lake and the following contaminants were detected at concentrations exceeding the Ontario LEL, phenanthrene (3.1 ppm), fluoranthene (3.1 ppm), pyrene (2.3 ppm), benzo(a)anthracene (0.86 ppm), benzo(a)pyrene (0.7 ppm), chrysene (1.1 ppm), aroclor 1260 (PCB) (0.031 ppm), arsenic (12.2 ppm), cadmium (1.74 ppm), chromium (36.5 ppm), copper (66 ppm), lead (554 ppm), mercury (1.0 ppm), and zinc (487 ppm). No Ontario LEL has been established for cyanide but it was detected at 3.31 ppm.

The aqueous samples collected from Hilliard Creek, Bridgewood Lake and Silver Lake did not reveal concentrations of hazardous substances at significant concentrations. The samples were analyzed for TCL and TAL metals, plus cyanide and hexavalent chromium. Arsenic, barium, calcium, chromium, iron, lead, magnesium, manganese, potassium, sodium, total cyanide and zinc were the inorganic contaminants identified in the surface water sampling event. A summary of the results are presented below:

Compound	Concentration				
	SW-1	HC-1	HC-2	BL-1	SL-1
Arsenic	6.82	6.52	8.76	ND	ND
Barium	189	199	141	111	49.3
Calcium	21,200	22,500	21,600	8,600	15,300
Chromium	ND	6.1J	ND	ND	ND
Iron	865	922	1,090	719	478
Lead	120	1.36	4.98	6.09	ND
Magnesium	4,220	4,510	4,360	1,640	3,980
Manganese	128	136	106	9.8J	31

Potassium	3,390	3600	3540	977J	3590
Sodium	14,700	15,700	15,500	10,300	13,600
Zinc	16J	20	26	14.7J	ND
Total Cyanide	10.6	11	ND	ND	ND

Notes:

Results in ug/L

J - Estimated

3.2.6.2.4 US EPA July 1999 Investigation

In June and July 1999, under the direction of the US EPA, environmental investigations along Hilliard Creek resumed. Sampling was conducted during this event by the REAC team of Lockheed Martin.

During the initial sampling event on 30 June 1999, 10 soil samples were collected and analyzed by XRF analyses. These soil samples were collected to assist in developing the sampling plan for the more intensive plan, implemented on 7 July 1999. Based on the results of the 30 June sampling event the US EPA WAM directed that soil samples be collected at 25-foot intervals and that samples be collected 25 and 50 feet from the creek during the next (7 July 1999) sampling event.

During the 7 July 1999 sampling event, 155 soil samples and one suspected waste sample were collected and analyzed by XRF. The soil samples ranged in lead concentration from 75 mg/kg - 22,000 mg/kg. On 9 July 1999, two additional waste samples were collected. The suspected waste samples ranged in lead concentration from 45,000-71,000 mg/kg. Sixteen of the soil samples analyzed by the US EPA by XRF analyses were submitted for TAL analyses for confirmatory analyses of the XRF data. The confirmatory analysis indicated provided confirmation of the XRF analyses for lead.

3.2.6.2.5 Removal Action

On 30 September 1999 the US EPA Regional Administrator, Region 2 signed an AOC for a Removal action at the Hilliard Creek site requiring Sherwin-Williams to delineate the extent of contamination at accessible areas of the site; contain the contamination by use of engineering controls in accessible areas; obtain access; post signs where appropriate; and conduct site inspections on a quarterly basis. The AOC specified Sherwin-Williams to conduct additional sampling, if necessary, to delineate the accessible areas needing restriction, where the potential for direct contact with lead contamination in soils and sediments in excess of 400 ppm existed. Further, the AOC required Sherwin Williams to determine the areas along Hilliard's Creek

beyond Hilliards Road that had soils/sediments contaminated with lead above 400ppm and implement access restrictions, if necessary.

According to the 30 September 1999 AOC No. 02-99-2037 Sherwin-Williams and US EPA, the site was defined in the AOC as in and around portions of Block 8.01, Lots 3.01 and 3.03; Block 19.01, Lots 1, 1.01, and 1.07; Block 20, Lot 1; Block 27, Lot 2; and Block 58.01, Lots 1.01, 2.01, 2.02, 6.01, 6.04, 7.01, 8.01, 9.06, 9.08, 10, 11.02, 12.01 and 13.01, in the Borough of Gibbsboro, Camden County, New Jersey. However, in the course of the work, additional lots were investigated.

Sherwin-Williams initiated field investigation activities on 30 November 1999 and continued through until 5 January 2000.

A total of 16 transects across Hilliard Creek, west of W. Clementon Road, were completed, with sampling points on either bank and the creek itself. Additionally, eight points were selected along the southern bank of the stream in a 700-foot stretch between Hilliard Road and Gibbsboro-Clementon Road along a trail, which, for a portion of its length, borders the bank of the creek. Additionally, six borings were positioned along the southern berm surrounding the manmade pond located off of Gibbsboro-Clementon Road.

In order to complete the horizontal and vertical delineation of lead additional samples were collected along transects TO1, TO2, T06, TO7, TO8, T13, and T14.

Surface soil samples were also collected from within the approximate boundary of Hilliard's Creek 100-year floodplain between Clementon-Gibbsboro Road and Hilliard's Road. The flood plain was determined based on the available NJDEP GIS coverages and the professional judgment of Weston personnel. The objective of this sampling was to determine whether periodic flooding might have transported contaminated sediments away from the Hilliard's Creek channel. Samples were collected from transects located perpendicularly to the perimeter of the flood plain. The transects were spaced approximately 200 feet apart. Transects were biased towards lower lying areas which were more susceptible to flooding and deposition. Along each transect samples were collected at approximately 30 foot intervals as shown on Figure 3-11. Only surface soil samples were collected based on the postulated transport and deposition mode. All surface soil samples were collected and analyzed for lead

All samples were analyzed for lead. Approximately twenty-five percent of all samples were analyzed for TAL metals plus cyanide, five percent for TCLP metals (including copper and zinc), five percent for TCLP VOC and BNA analyses, five percent for TCL VOC and BNA analyses. All sediment samples collected during the initial round of sampling were submitted for pH, TOC and grain size analyses. Generally, concentrations of lead in surface soil was below the NJDEP RDCSCC. However, elevated concentrations of lead were often detected in soils deeper than two feet, most notably at the properties along Steven's Drive and 165 Kirkwood

Drive (lead concentrations as high as 24,800 ppm). Elevated concentrations of lead were also frequently detected in the sediment samples.

The December 1999 sampling conducted by Sherwin-Williams west of Gibbsboro/Clementon Road which extended past Hilliard's Road into Kirkwood Lake along Steven's Drive in Voorhees, NJ, detected lead, arsenic, barium, chromium, copper, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene concentrations in the top six inches of the soil/sediment samples as high as, 32,500 ppm, 1030 ppm, 7,100 ppm, 2390 ppm, 719 ppm, 9.7 ppm, 7.9 ppm, 9.7 ppm, 3.7 ppm, and 4.1 ppm, respectively, exceeding NJDEP residential soil cleanup criteria. This sampling event also reported lead, arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene concentrations between 1.5 and 2.0 feet below the ground surface (bgs) in the soil/sediment samples as high as, 24,300 ppm, 94.6 ppm, 2.3 ppm, 2.1 ppm, 2.7 ppm, 1.1 ppm (estimated), and 1.6 ppm, respectively, exceeding NJDEP residential soil cleanup criteria.

During the December 1999 removal sampling event, five sediment samples were taken for lead analysis at the upper portion of Kirkwood Lake, and its influent from Hilliard's Creek, east of 14 Stevens Drive. The lead concentration results for sediment samples taken from 0 to 0.5 feet below the lake's bottom surface ranged from 186 ppm to 2930 ppm. The lead concentration results for sediment samples taken from 1.5 to 2.0 feet below the lake's bottom surface ranged from 11.6 ppm to 1810 ppm. The portion of the sediment samples that were analyzed for other parameters, in addition to lead, found the following concentration ranges from 0 to 0.5 feet below the lake's bottom surface: arsenic from 9.8 to 242 ppm, barium from 81.8 to 721 ppm, cadmium from 0.56 to 9 ppm, chromium from 37.8 to 305 ppm, copper from 7.2 to 154 ppm, iron from 2960 to 29,100 ppm, and zinc from 56.5 to 800 ppm, with the lead, arsenic chromium and copper concentrations exceeding the Ontario SEL, and the cadmium, iron, and zinc concentrations exceeding the Ontario LEL; and, the following potential sediment contaminants were found 1.5 to 2.0 feet below the lake's bottom surface at the following concentration ranges: cadmium from 0.41 to 2.1 ppm, chromium from 3.3 to 31.5 ppm, and nickel from 0.26 to 20.5 ppm, with all of these potential contaminants' concentrations exceeding the Ontario LEL.

A residential property at 165 Kirkwood Drive had very high levels of lead contamination at the ground surface (lead concentrations as high as 24,800 ppm) and at depth. Two surface soil samples analyzed for lead in a heavily wooded area along Hilliard's Creek in the vicinity of the residential property line for 185 Kirkwood Drive had lead concentrations of 1970 ppm and 3350 ppm.

Based on the results on the above investigations, additional sampling was conducted at the 165 Kirkwood Drive property to fully delineate the extent of lead-contaminated soils. To minimize matrix variability effects and to collect information that is suitable for remedy selection, the property was divided in to grids representing no more than 20 cubic yards each. Four borings

were to be collected from each of these grids and sampled at intervals of 0 to 6 inches, 12 to 18 inches, and 24 to 30 inches. The four samples from each interval were composited on an equal weight basis and analyzed for total lead. Additional depths were sampled, where the 24-30 inch sampling interval had concentrations exceeding 400-mg/kg lead.

To assess disposal options, one sample was collected from each grid. Based on sample appearance and contaminant concentration up to 5 adjacent grid samples were composited on an equal weight basis, at the laboratory, to make an area composite. Area composite were analyzed for TCLP metals only. Ten percent of the soil samples were analyzed for TCL VOCs and TCL SVOCs. Twenty five percent of the samples were collected and analyzed for TAL metals. Five percent of the samples were analyzed for TCLP VOCs, SVOCs, metals, copper, and zinc.

In April 2000, Sherwin Williams conducted the aforementioned additional removal sampling at 165 Kirkwood Drive to further delineate the horizontal and vertical extent of lead contamination on this particular residential property. Sherwin Williams reported composite lead concentrations in the top six inches of the soil as high as 24,800 ppm (estimated) exceeding NJDEP residential soil cleanup criteria. Sherwin Williams reported soil composite lead concentrations between 1 and 1.5 feet, 2.0 and 2.5 feet, 3 and 3.5 feet, 4 and 4.5 feet, 5 and 5.5 feet, and 6 and 6.5 feet below the ground surface as high as, 38,800 ppm (estimated), 29,300 ppm (estimated), 23,300 ppm (estimated), 22,200 ppm (estimated), 13,600 ppm, and 3,730 ppm, respectively, exceeding NJDEP residential soil cleanup criteria. Sherwin Williams reported TCLP results for lead as high as 38.8 mg/L, 39 mg/L, 40.3 mg/L, 53 mg/L, and 70.4 mg/L for five soil composite samples collected in April 2000 at the residential property just south of Hilliard Road.

In September 2001, Sherwin Williams collected additional removal samples at residential properties along Stevens Drive, Gibbsboro Road/W.Clementon Road, and 165 Kirkwood Road. Sherwin Williams collected 62 soil samples from 30 soil borings from Stevens Drive and seven soil samples from three soil borings from a residential property at 78 W. Clementon Road, samples were collected at 0-0.5 feet and 1-1.5 feet bgs, all samples were analyzed for lead, and 10% of the samples were analyzed for TCL VOCs and SVOCs, and TAL metals. A total of 242 samples were collected and analyzed from 50 soil borings on-site for lead using an XRF unit with approximately 10% of the samples being sent to an off-site lab for confirmatory lead analyses at the 165 Kirkwood Road residential property to complete the vertical and horizontal delineation of contaminated soils. Once the delineation was complete, 20 clearance samples were collected and analyzed for TCL VOCs and SVOCs, and TAL metals. In November 2001, six soil samples from three soil borings were also collected at 185 Kirkwood Road at the request of US EPA, samples were collected at 0-0.5 feet and 1-1.5 feet bgs, five of the six samples were analyzed for lead, and the remaining sample was analyzed for TCL VOCs and SVOCs, and TAL metals. In addition, 10 bulk samples from 10 locations were collected from 165 Kirkwood Road for the purpose of assessing treatability options.

During the September and November 2001 removal sampling event, only one sample at a residential property along Stevens Drive (i.e., 14 Stevens Drive) exceeded the removal action level of 400 ppm for lead and that sample was detected at 1.5 to 2.0 feet bgs (sample S-14-04, lead concentration of 4710 ppm). With regards to 165 Kirkwood Road, analytical results indicated that 51 samples were detected above the NJDEP residential soil cleanup criteria (see Table 3-12).

Additional sampling was completed at 165 Kirkwood Drive and the data from those investigations has been incorporated in the data table attached to this work plan. The investigations were summarized in the report entitled "Removal Action Report, Hilliard Creek Site, Gibbsboro, New Jersey", dated May 2002. Sampling was also conducted along the embankments of Kirkwood Lake, downstream of the area covered in this work plan. That sampling was presented to the US EPA in the report entitled: "Removal Action, Addendum Report, Kirkwood Lake, Hilliard Creek Site" dated March 11, 2003. The results of those sampling activities are not presented in this work plan but may be incorporated into any future addendum to this RI/FS Work Plan.

Surface water samples were collected from the stream in order to evaluate whether or not the stream was transporting contaminated sediments or dissolved-phase contaminants. Ten samples were collected from nine distinct sample locations in December 1999. The samples were collected at points where elevated concentrations of contaminants were observed during sediment sampling and on the physical condition of the stream network. Samples were analyzed for TAL metals (filtered and unfiltered), total organic carbon, total dissolved solids and hardness. Samples submitted for dissolved analyses were filtered in the field through 0.45-micron filters. A disposable dedicated filter was utilized for each individual sample. Field measurements of dissolved oxygen, pH and stream velocity were collected prior to sample collection. Surface water samples were collected from a depth of approximately 2 inches below the water surface. Aluminum, arsenic barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, manganese, potassium, sodium, vanadium and zinc were detected (see Table 3-14). Arsenic exceeded the NJDEP FW-2 standard at sample points SW-07 (19.1 ug/L) and SW-08 (20.4 ug/L). Copper exceeded the US EPA acute criterion at sample point SW-06 (18.6 ug/L). Iron exceeded the US EPA chronic criterion at four sample points (range from 1080 to 1900 ug/L). Lead exceeded the NJDEP FW-2 standard and US EPA acute and chronic criteria at nine of the sample points (range from 8.1 to 700 ug/L).

In April/May 2000, Sherwin-Williams installed fencing and "no trespassing" signs at the Gibbsboro Wildlife Preserve and accessible areas along the course of Hilliard Creek (i.e., a wetland area located at the end of Democrat Way, a flood plain area located along Hilliard's Creek flowing past a residential property in the vicinity of North and West Roads, and a foot path on the southern bank of Kirkwood Lake opposite of Stevens Drive) to preclude access and to reduce the threat of direct contact to areas where contaminated soils or sediments were detected.

Subsequent to April 2000, Sherwin-Williams has undertaken additional removal activities some of which have been noted above. These removal activities are still ongoing and any relevant information pertaining to these removal activities may be incorporated into any future addendum to this RI/FS Work Plan.

3.2.7 Railroad Track Site

US EPA discovered this area of concern while performing oversight of Sherwin-Williams' removal sampling activities at the U.S. Avenue Burn Site directly across the street from the railroad tracks area. US EPA requested an investigation based on an US EPA On-Scene Coordinator's (OSC) observation of discolored soils and these observations were relayed to Sherwin-Williams in a 30 November 1995 letter, which requested Sherwin-Williams to investigate the area of the surficial discolored soils. In the same letter US EPA required Sherwin-Williams to prepare a written Plan of Action prior to initiating field activities.

Sherwin-Williams performed a preliminary site inspection of the area on 13 February 1996. US EPA was present during this inspection. The preliminary site inspection included drilling a series of hand auger borings to delineate the approximate horizontal and vertical extent of discolored soils. Subsequently, Sherwin-Williams developed a Statement of Work (SOW), which was approved by US EPA on 2 April 1996. The sampling investigation was performed on 13 and 14 May 1996, and a draft summary report was issued on 30 January 1997. All activities were performed under the oversight of the US EPA OSC and the agency's subcontractor, Ecology and Environment (E&E), and later, Tetra-Tech/PRC. Under the direction of the OSC, US EPA's contractor also collected split soil samples of representative samples collected by Weston.

A total of 27 soil samples were collected (inside and outside areas of visible discoloration) and analyzed for arsenic, barium, chromium, and lead; field quality assurance and quality control (QA/QC) samples were also collected. The QA/QC samples included two field blanks, one trip blank, and two duplicate samples. In addition, two waste characterization soil samples were collected from the zone of the most highly discolored soils for Toxicity Characteristic Leaching Procedure (TCLP) metals, TCLP volatile organic compound (VOC), and TCLP semivolatile organic compound (SVOC) analyses. Two soil samples were also analyzed for Target Compound List (TCL) VOCs and SVOCs. All soil sample locations were biased (by design) towards areas that exhibited the highest degree of discoloration.

TCL VOCs were analyzed for but not detected at concentrations greater than the New Jersey Department of Environmental Protection's (NJDEP's) Residential Direct Contact Soil Cleanup Criteria (RDCSCC). TCL SVOCs were analyzed for and the following potential contaminants were detected at concentrations greater than NJDEP's RDCSCC: benzo(a)anthracene at 2.6, 4.8, & 4.2 ppm; benzo(b)fluoranthene at 3.5 & 3.2 ppm; benzo(k)fluoranthene at 5.0 & 4.7 ppm;

benzo(a)pyrene at 4.2 & 3.8 ppm; and indeno[1,2,3-cd]pyrene at 2.0 & 1.8 ppm. Lead was detected in excess of the RDCSCC of 400 milligrams per kilogram (mg/kg) in 16 of the 27 soil samples analyzed (lead concentrations of 66400, 45000, 29400, 47300, 41200, 56100, 460, 48300, 66800, 26500, 4740, 51000, 51400, 443, 884, & 2690 ppm were found). Barium also exceeded the NJDEP RDCSCC of 700 mg/kg in 13 of the 27 samples analyzed (barium concentrations of 1380, 3790, 8220, 8500, 955, 3010, 5270, 5760, 6710, 5810, 3650, 6180, & 6130 ppm were found). Arsenic exceeded its RDCSCC of 20 mg/kg in 9 of the 27 samples analyzed (arsenic concentrations of 29.2, 28.1, 79.5, 40.2, 25.2, 25.9, 38.4, 53.8, & 24 ppm were found). NJDEP has not established cleanup criteria for chromium.

Based on the results of the two waste classification samples analyzed, the discolored soils may be considered hazardous waste. TCLP test results for lead were greater than US EPA's regulatory limits (values of 602 ppm, 1250 ppm, and 522 ppm were found for lead).

Based on the results of the investigation, Weston prepared and issued a *Summary Report of the Railroad Track Investigation* dated 30 January 1997. The report recommended "to address this area (60 by 120 feet) through excavation and removal of the impacted soils. The effectiveness of the removal action would be confirmed through the collection of post-excavation soil samples." Sherwin-Williams began the removal of this material on 28 April 1997; however, US EPA issued the Unilateral Administrative Order for Removal Response Activities ("Order") dated 1 May 1997. On 5 May 1997, the local Gibbsboro police stopped work at the site due to some permit concerns, even though permits had been obtained. On 14 May 1997, Weston submitted a draft work plan to US EPA, which was subsequently modified on 3 July 1997 based on comments from US EPA. The final work plan for the railroad track removal action was issued on 7 July 1997, and was approved by US EPA. The excavation activities restarted on 21 July 1997, with Sherwin-Williams performing the removal action under the requirements set forth in the Order.

First, the soils overlying the discolored soils over the entire excavation area were removed. Based on field observations, this overlying soil ranged from a thin veneer to less than 1 foot in thickness. After the overlying soils were scraped, the discolored soils were removed until visibly clean soil was encountered. Once discolored soils were removed, post-excavation soil samples were collected for lead and arsenic analyses, consistent with the US EPA-approved work plan. Upon review of the analytical results, excavation activities were performed to remove additional soils, if required by US EPA. US EPA and its on-site contractor (Tetra-Tech/PRC) performed a detailed inspection of each post-excavation sample location area to determine whether they concurred with Weston's conclusion that each location was visibly clean. Pending the regulatory review of each location, additional removal of soils was performed, where required by US EPA.

Upon completion of excavation activities on both the west and east sides of the tracks, the railroad bedding material was vactored. The vactor system is a high-power vacuum that removes material into a dump truck. All air from the vactoring process was filtered with a HEPA filter

prior to exhausting. To speed up the operation and to increase its efficiency, the shallow railroad track bed was loosened up with shovels and picks prior to being vactored. The vactoring of the railroad bed removed 0.5 to 2.0 feet of bedding material. Upon completion of vactoring, post-excavation soil sampling was performed to verify the effectiveness of the removal action.

Post-excavation soil samples (sidewall, floor, and perimeter) were collected from each sampling location at a depth of 0 to 6 inches below surface or along the sidewall. Soil samples were collected and homogenized using stainless steel decontaminated bowls and trowels. Perimeter post-excavation soil samples were collected in 30-foot centers 2 feet beyond the extent of visibly discolored soils along the western excavation wall. Soil samples were submitted for lead and arsenic analyses to verify the effectiveness of the removal action consistent with the Order. Cleanup levels for the site were 400 mg/kg for lead and 20 mg/kg for arsenic. RECRA LabNet, Inc., a State of New Jersey certified analytical laboratory, provided soil results with 24-hour laboratory turnaround time. Three water samples were collected for analysis to determine whether the water in the excavation pits were hazardous as defined by US EPA. One composite water sample each was collected from the ponded water in the east and west excavation areas. Both of these samples were analyzed for metals and the results indicated that the water in these two areas were non-hazardous. A third sample was collected from the west side bermed excavation in an area known as Pool No. 1. The water sample was analyzed for arsenic and lead only and the results of the analysis indicated that the water was contaminated with lead and arsenic (concentrations of lead (6820ug/L) & arsenic (1020 ug/L)). The sample was considered hazardous by US EPA, consistent with RCRA regulations. Therefore, approximately 1,850 gallons of water was removed from Pool No. 1 and was sent off-site for disposal as a hazardous liquid. Soil and water samples were sent to the lab via courier (Rapid Delivery Service) on a daily basis. In addition to the lead and arsenic analyses, each sample was screened with an organic vapor analyzer (OVA) and an HNu photoionization detector (PID) for the presence of VOCs. Each sample was also observed for indications of possible contamination such as the presence of fill material, staining, discoloration, or odor. Field observations indicating possible contamination were recorded in a field notebook. The post-excavation soil sample results were discussed with US EPA or its on-site contractor on a daily basis to verify the visible results.

The Order required “excavation and off-site treatment and/or disposal, as appropriate, of contaminated soils and sediments containing arsenic at concentrations over 20 mg/kg and/or lead at concentrations over 400 mg/kg.” However, post-excavation sampling result from W0922973 indicated lead at a concentration of 598 mg/kg and arsenic at 16.4 mg/kg. This sample and samples along the western side of the excavation were collected from an organic mat layer. Excavation activities were not performed at this location due to its proximity to Bridgewood Lake (approximately 5 feet). Analytical results of all other post-excavation samples on the western side of the railroad tracks were lower than the action level of 400 mg/kg, and that this action (i.e., no further excavation for removal purposes) was in compliance with the Removal Order in all locations except for the three locations noted in the Removal Action Report.

Post-excavation sampling results for W0905973 and W0905974, collected from the eastern excavation, indicate lead at a concentration of 409 (depth of 2 feet bgs) and 6,820 mg/kg (depth of 4 feet bgs), respectively, and arsenic at a concentration of 16.9 (depth of 2 feet bgs) and 126 mg/kg (depth of 4 feet bgs), respectively. Post-excavation sampling result for W0905978 collected from the eastern excavation, approximately 35 feet north of the two aforementioned post-excavation sampling points, indicated lead at a concentration of 3370 mg/kg and arsenic at a concentration of 20.4 mg/kg at a depth of 4 feet bgs. These samples were collected as sidewall samples along the eastern side of the excavation adjacent to United States Avenue. Additional excavation was not performed at these locations due to the potential for undermining the integrity of the road (United States Avenue). The discolored material was approximately a 1-inch-thick band of material over a lateral length of approximately 10 feet at post-excavation points W0905973 and W0905974. This discolored material was above the water table and was underlying the paved roadway. Sherwin-Williams and US EPA agreed that these areas would not be excavated at this time, and no further action would be performed under this Removal Order.

A map presenting the extent of the excavation and the locations and results of the post-excavation samples is presented in Appendix F. All of this information was submitted to US EPA in the draft Removal Action Report for the Rail Road Track dated August 2000.

3.2.8 Paint Works

Since 1991, Sherwin-Williams conducted a series of detailed and extensive investigation at the Paint Works, under the oversight of the NJDEP. The findings of these investigations were presented in great detail in the February 2001 submittal to the NJDEP, a copy of which was provided to the US EPA. While the Paint Works are not included in the AOC at this time, a synopsis of the work conducted there to date is included, because of its potential relationships with the sites covered by the AOCs and because these investigations have provided a great deal of information on stratigraphy and regional conditions.

3.2.8.1 Areas Of Environmental Concern

Four areas of environmental concern (AECs) have been identified at the Paint Works. These have been designated as AEC I through AEC IV. (Refer to Figure 3-14 for locations.)

- AEC IFormer Tank Farm A.
- AEC IIFormer Tank Farm B.
- AEC IIIGroundwater Seep Area.
- AEC IVFormer Lagoon Area.

AECs I and III have been combined into AEC I/III because of the similarities in the nature of the contaminants and the postulated continuity of the two AECs.

AEC I/III

AEC I/III encompasses the following major features of the study area:

- Former Tank Farm A, consisting of USTs and ASTs and their associated piping, which were previously removed by Scarborough.
- The vacant unpaved parcel north of former Tank Farm A.
- The former gasoline service station containing USTs.
- Septic Systems I and IV (currently in service) installed and operated by Scarborough.
- Hilliard Creek (from Foster Avenue to Clementon-Gibbsboro Road).
- The Seep Area (former Academy Paints (former building 67) parking lot and Police Station (former building 50) Seep Area).
- Former Pump House

AEC II

AEC II encompasses the former Tank Farm B and Septic Systems II and III. Septic Systems II and III were removed from service on or about 16 June 1993 (Scarborough, 1993) following connection of the facilities serviced by them to public sewerage.

AEC IV

AEC IV encompasses the former lagoon area including the former settling ponds, holding pond, and sludge disposal area.

3.2.8.2 History Of Investigations

To date the following activities have been completed:

1. Phase I RI activities (August 1991 through January 1992):
 - Shallow groundwater screening investigation.
 - Installation of nine groundwater-monitoring wells.
 - Sampling and analysis of soils, sediments, and surface waters.
 - Monitoring of groundwater levels, and sampling and analysis of two rounds of groundwater samples from 17 monitoring wells.
 - Completion of a regional water well survey and a baseline ecological assessment.
 - Submission of an RI Report.
2. Phase II RI activities (June 1993 through October 1993):

- Supplemental shallow groundwater screening investigations.
- Surficial geophysical investigations.
- Sampling of four active septic systems.
- Installation of eight additional groundwater-monitoring wells and three temporary well points.
- Hydraulic testing of selected monitoring wells to determine aquifer characteristics.
- Supplemental sampling of soils, sediments, and surface waters.
- Monitoring of groundwater levels, sampling and analysis of two rounds of groundwater samples from the eight new wells and one well point, and sampling and analysis of an additional two rounds of groundwater samples from the 17 monitoring wells installed during Phase I.
- Submission of a Phase II RI Report.

3. Phase III Conceptual Design RI activities (July 1995 through August 1995):

- Drilling and sampling of 60 soil borings.
- Installation of one new well and one replacement well.
- Installation and sampling of 14 shallow well points.
- Abandonment of three monitoring wells.
- Installation of staff gauges.
- Measurement of synoptic water levels.
- Collection and analysis of groundwater samples.
- Free-phase product bail-down tests.
- Geophysical survey.
- Underground storage tank (UST) investigation at the former gasoline station.
- Submission of a Phase III Conceptual Design RI Report.

4. Phase IV activities (September 1996 through January 1997 with supplemental work in May 1997):

- Drilling and sampling of 29 soil borings.
- Installation of four deep groundwater-monitoring wells.
- Collection and analysis of two rounds of groundwater samples.
- Collection and analysis of one surface water sample.
- Collection and analysis of one sediment sample.
- Measurement of synoptic water levels.
- Submission of Phase IV RI Report.

5. Phase V activities (July 1998 through January 2000):

- Drilling and sampling of 80 soil borings.
- Installation of eight deep groundwater-monitoring wells.
- Installation of one shallow groundwater monitoring well.
- Collection and analysis of 40 groundwater samples.
- Screening of 38 groundwater samples from multiple locations and depths.
- Slug testing of deep wells.
- Measurement of synoptic water levels.
- Free-phase product analysis.
- Submission of RI Report.

This work was conducted in accordance with the following NJDEP-approved work plans:

- *Work Plan for the Remedial Investigation of the Former Sherwin-Williams Site, Gibbsboro, New Jersey* (Weston, June 1991).
- *Work Plan for the Remedial Investigation Phase II Activities, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, August 1992).
- *Work Plan for the Conceptual Design Remedial Investigation of the Former Sherwin-Williams Site, Gibbsboro, New Jersey* (Weston, September 1994).
- *Phase IV Remedial Investigation Work Plan, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, July 1996).
- *Supplemental Work Plan Addendum, Remedial Investigations, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, 9 July 1998).
- *Supplemental Work Plan Addendum II, Remedial Investigations, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, July 1998).

The following investigation reports were submitted to NJDEP:

- *Draft Remedial Investigation Report, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, April 1992).
- *Remedial Investigation Report, Phase II, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, March 1995).
- *Conceptual Design Remedial Investigation Report, The Paint Works Corporate Center Site, Gibbsboro, New Jersey* (Weston, September 1995).

Of the above documents, only the April 1992 report has been approved by the NJDEP. Information contained in the other reports (as well as the April 1992 one) has been excerpted and incorporated in the present report, to provide complete discussion of all the investigative activities at the site.

In addition to the investigations, Sherwin-Williams expedited the activities associated with the Seep Area portion of the site. NJDEP classified the Seep Area as an area of Immediate Environmental Concern (IEC), based on its determination of potential impacts to human health and the environment. Sherwin-Williams entered into a second ACO to address this IEC. To address the IEC, Sherwin-Williams installed a soil vapor extraction (SVE) and free-phase product removal system in this area to remediate free-phase product. Free product removal equipment was also installed in former Tank Farm A. This system is currently operating. NJDEP-approved documents prepared for this remedial effort are:

- *Remedial Action Work Plan to Address the Immediate Environmental Concerns at The Paint Works Corporate Center Site, Gibbsboro (IEC RAW), New Jersey* (Weston, November, 1995).
- *Focused Feasibility Study to Address Free-Floating Product Areas at the Paint Works Corporate Center Site, Gibbsboro (IEC RAW), New Jersey* (Weston, 16 November 1995).
- *SVE Full-Scale Conceptual Design, The Paints Work Corporate Center Site, Gibbsboro, New Jersey* (Weston, 7 June 1996).

Sherwin-Williams also carried out soil-removal action in the area between Hilliard Creek and the Gibbsboro Police Station (former building 50). This work is described in:

- *Draft Remedial Action Report, Police Station Area, The Paints Work Corporate Center Site, Gibbsboro, New Jersey* (Weston, April 1999).

Twelve free-phase product recovery system progress reports have also been submitted to NJDEP to date.

3.2.8.3 Contaminant Assessment

This section summarizes the conclusions presented in the February 2001 report to the NJDEP. In many cases, that report recommended additional investigations in areas that are transitional to the sites covered by this AOC. The purpose of the subsequent discussions is to present information that may have a direct bearing on the sites covered under this AOC and to identify the areas where additional investigations have been proposed to the NJDEP.

3.2.8.3.1 AEC I/III

SOIL

A total of 139 soil samples were collected and analyzed from AEC I/III. During the Phase IV investigation, to assist in sample selection and contaminant delineation, many soil samples were screened in the field using immunoassay methods. Table 3-15 presents the frequency of analyte detection, and the range and average concentration of the detected analytes.

Former Tank Farm A

Sampling was conducted in Tank Farm A during five phases of investigations that occurred between August 1991 and January 2000. In the area of former Tank Farm A, acetone, ethylbenzene, methylene chloride, and xylene exceeded the SSCC. Acetone and methylene chloride are laboratory contaminants and are not considered contaminants of concern by Sherwin-Williams. The NJDEP still considers these constituents contaminants based on the fact that they are either not found in the associated blank or their concentrations dramatically exceed those found in the associated blank. Samples with these exceedances were collected from an interval just above the saturated zone. This suggests that while unsaturated zone soils may not be contaminated, the zone immediately above the groundwater is contaminated. This would agree with the groundwater analytical data and observations of free-phase product in certain monitoring wells.

Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA.

North of Former Tank Farm A

Sampling was conducted in the area north of former Tank Farm A during four phases of investigations that occurred between June 1993 and January 2000. In the borings installed in the parking lot to the north of former Tank Farm A, the SSCC were exceeded at locations TB-38, TB-62, and TB-65 for one or more of the following compounds: naphthalene, styrene, xylenes, benzene, ethylbenzene, 2,6-dinitrotoluene and methylene chloride. Elevated MDLs were reported for samples collected during the Phase IV investigation, and these MDLs could obscure exceedance of soil cleanup criteria for the remaining parameters, even though the MDLs are generally less than one order of magnitude above the cleanup criteria. Further review of the data indicates elevated concentrations of TICs in TB-62 and TB-65, suggesting that the elevated MDLs are probably due to interferences from these compounds. Total TIC concentrations are generally high, estimated in the thousands of mg/kg (although never as high as 10,000 mg/kg). The TICs detected were cyclic, methylated aromatics, and alkanes. Polychlorinated biphenyl (PCB) analysis results of the soil boring samples collected in January 1999 from locations TB-38, and TB-62 through TB-65 indicated that no PCBs were detected in any of the samples.

However, NJDEP noted that these PCB samples were taken at depth and that there were no surface soil samples that were analyzed for PCBs.

The northern extent of these exceedances has been fully delineated. The southern extent has not been fully delineated and additional delineation is proposed. Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA.

Area North of Foster Avenue

Sampling was conducted in the area north of Foster Avenue during four phases of investigations that occurred between June 1993 and January 2000. In the borings installed in the parking lot to the southwest of the former Scotko Building (also referenced as former building 58 during Lucas/Sherwin Williams' ownership in portions of this RI/FS Work Plan and in Figures 2-3 and 2-4), xylenes, thallium, lead and methylene chloride were detected at concentrations above the SSCC. However, elevated MDLs were reported for samples collected during the Phase IV investigation, and these MDLs could obscure exceedance of soil cleanup criteria for the remaining parameters, even though the MDLs are generally less than one order of magnitude above the cleanup criteria. Further review of the data indicates elevated concentrations of TICs, suggesting that the elevated MDLs are probably due to interferences from these compounds. Total TIC concentrations are generally high, estimated in the thousands of mg/kg (although never as high as 10,000 mg/kg). The TICs detected were cyclic, methylated aromatics, alkanes, and methyl-alkanes.

Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. These activities included the drilling and sampling of additional soil borings.

Seep Area

Sampling was conducted in the Seep Area during five phases of investigations that occurred between August 1991 and January 2000. Although some MDLs were elevated and could have obscured some exceedances, they were less than one order of magnitude above the cleanup criteria. Generally, the extent of these exceedances should be considered as having been delineated, either because additional samples were collected in the vicinity or because the level of the exceedances is relatively low, less than one order of magnitude over the criteria.

An SVE and free-phase product recovery systems have been installed to address contaminated soils and free-phase product in this area. In addition to removing the free-phase product, the recovery system provides a degree of hydraulic control by forcing free-phase product to move towards the extraction wells. Remedial activities in this area have been ongoing for

approximately 3 years. At the appropriate time, soils in the vadose zone will be resampled to determine the effectiveness of the system.

Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. These activities included an extensive test-pit and soil-boring program to ascertain the extent of the free-product.

Former Pump House

Sampling was conducted in the former pump house area September 1996 and January 2000. As part of the Phase IV investigation, shallow soil borings were advanced around the four corners of the former pump house. This pump house transferred wastewater from the operations to the lagoon area (AEC IV). The interior of the structure was inspected and found to be clean; no sludge or other potentially hazardous materials were found.

The soil borings were advanced with a stainless steel hand auger decontaminated between each depth interval and between each boring location. A hand auger was used due to the shallow nature of groundwater near the former pump house (approximately 2.5 feet BGS). It should be noted that soil logs were not prepared for TB-70, TB-71, TB-72, and TB-73 because of the shallow depth of the boreholes. The four borings were advanced to the top of groundwater and screened with a PID and FID detector. In addition, the soils were inspected for visible evidence of contamination and or the presence of sludge. As per the Phase IV Work plan, the sample that exhibited the highest degree of contamination was submitted for TCL VOC, TCL SVOC, and TAL Metals analysis. The soil sample was collected above the groundwater table.

Test boring TB-70 was advanced to a depth of 1.5 feet BGS where groundwater was observed. PID and FID readings detected at this location were 1.8 and 60 units, respectively, and no evidence of contamination and/or presence of sludge was detected. TB-71 was advanced to a depth of 3.2 feet BGS, and groundwater was observed at 2.5 feet BGS. PID and FID readings detected at this location were 2.2 and 56 units, respectively. No evidence of contamination and/or presence of sludge was detected. TB-72 was advanced to a depth of 2.5 feet BGS and groundwater was observed at 2.5 feet BGS. PID and FID readings detected at this location were 1.7 and 107 units, respectively. Again, no evidence of contamination and/or presence of sludge was detected. TB-73 was advanced to a depth of 2.5 feet BGS, and groundwater was observed at 2.5 feet BGS. No PID and FID readings were detected at this location. However, some sludge and paint chips were observed. A soil sample with sludge and paint chips was collected and was sent to the laboratory for analysis. Since the boring location was adjacent to Hilliard Creek, additional delineation borings would have been in Hilliard Creek. Since a sediment sample and surface water sample were already collected (SSW-09) immediately adjacent to this area as per the Phase IV Work plan, additional delineation was not deemed necessary.

Based on the analytical results from TB-73, VOCs were not detected above the SSCC. Of the five compounds that were detected, two were qualified with blank contamination (acetone and methylene chloride) and TICs (terpene and unknowns) totaled 130 mg/kg. With regard to SVOCs, only PCP was detected at concentrations above the conservative SSCC of 6,000 (mg/kg with a concentration of 7,100 (mg/kg at TB-73. Metals analysis of TB-73 indicated that barium (14,500 mg/kg), copper (1,080 mg/kg), mercury (25.2 mg/kg), lead (1,040 mg/kg), and zinc (3,240 mg/kg) were all detected at concentrations above the SSCC.

During Phase V, boring TB-73 was re-sampled. Three additional borings (TB-95 through TB-97) were also collected within 10 feet of TB-73). No PCP exceedances occurred in any of the samples collected. TB-73 contained barium, copper, lead, zinc, mercury, and cadmium at concentrations greater than their respective SSCC values. Samples TB-95, TB-95D, TB-96 and TB-97 exceeded the SSCC for arsenic, barium and lead.

Removal of the pump house as remedial measure was proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA.

GROUNDWATER

A total of 185 groundwater samples were collected and analyzed from AEC I/III. Table 3-16 presents the frequency of analyte detection, and the range and average concentration of the detected analytes.

The extent of contamination in both the shallow and the deeper saturated zones has been defined. Benzene, ethylbenzene and xylenes were consistently detected at concentrations above the NJDEP GWQS in most of the wells. The highest concentrations in both zones were detected in the wells installed in the vicinity of former Tank Farm A, the vacant lot to the north, and the former gasoline service station. Other organic compounds, such as pentachlorophenol, and metals were also detected sporadically.

The shallow groundwater zone occurs in a quartzitic matrix. Groundwater occurs relatively close to the ground surface. Measurements of pH and dissolved oxygen collected from the on-site wells suggest that the conditions are favorable for aerobic microbial activity. Aerobic microbial faunas are known to degrade petroleum hydrocarbon compounds. The observed decrease in the concentration of hydrocarbon compounds in groundwater may be partially attributed to microbial activity, suggesting that the potential for natural degradation of these compounds exists at the site. The occasional detection of vinyl chloride suggests that dehalogenation of chlorinated hydrocarbons is also occurring. Presumably, the nonchlorinated hydrocarbons provide the electron source for the dechlorination. This type of assessment cannot be done at this time for the deeper saturated zone, because of the limited amount of observations collected to date.

Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. These activities included a groundwater sampling and analysis program.

Free-Phase Product

Previously Weston attempted to evaluate the nature of the free-phase product using statistical methods. During the last phase of work, more sophisticated, chemical analysis methods were utilized for this purpose, and the results are discussed below.

As previously discussed, the following samples were analyzed by GC:

SVE-3	SVE-5	SVE-6
SVE-1	MW-11	MW-26
MW-32	MW-36	MW-30
MW-24	MW-27 (11/2000)	MW-13R
MW-27 (12/ 2000)	MW-29	

No evidence of the presence of any petroleum product was found in samples SVE-3, MW-32, and MW-36.

No evidence of the presence of any organolead or organomanganese compounds was found in any of the free product samples.

The findings of the GC analyses are summarized in the paragraphs below.

Sample MW-24 contained a few hydrocarbon compounds in the range of toluene to naphthalene. These peaks may represent partially water-soluble aromatic compounds from a lower boiling range petroleum product.

Results for all of the remaining samples indicate the presence of a biodegraded, low boiling petroleum product. Some of these samples have lower boiling components than the other samples. Therefore, Trillium, Inc. (the chemistry expert subcontracted by Weston for this project) has divided these samples into two categories. Category A includes those samples with a significant amount of hydrocarbon compounds that are lower boiling than toluene, yet also have hydrocarbons that are consistent with the boiling points of methyl and dimethylnaphthalenes. Category B includes those samples that do not have a significant amount of hydrocarbons with boiling points less than toluene, but do contain hydrocarbons in the methyl-dimethylnaphthalene range. [Note that toluene has a boiling point of 110°C.] Both Category A and Category B hydrocarbons are primarily within the boiling range of 110°C to 260°C.

<u>Category A</u>	<u>Category B</u>	
SVE-6	MW-29	MW-30
MW-11	MW-27 (12/2000)	SVE-1
	MW-27 (11/2000)	MW-26
	MW-13R	SVE-5

Two samples in Category B deserve special comments. First, MW-30 appears to be a mixture of the aromatic water-soluble components of the petroleum product and a small quantity of water-insoluble petroleum product. Second, and much more significant, are the findings based on the GC/FID fingerprints of sample MW-27. This is the only sample that shows the presence of a petroleum product with a boiling range greater than the dimethyl naphthenes ($\sim 260^{\circ}\text{C}$). Also, this higher boiling product consists of normal alkanes that range from less than 12 carbon atoms (C_{12}) to about 20 carbon atoms (C_{20}). The normal C_{17} alkane to the isoprenoid pristane suggests that little aerobic biodegradation has occurred. Since this “fingerprint” was unlike any of the other sample “fingerprints,” the sample was collected a second time (in 12/00) in order to determine the “fingerprints” reproducibility. The two samples of MW-27 produced very similar “fingerprints.” Therefore, Trillium, Inc., (the chemistry expert retained to evaluate the data) has concluded that the higher boiling petroleum product observed in sample MW-27 is real and not an artifact of sampling and/or analysis.

Further information on the composition of the free-phase product was derived from the GC/MS analysis.

Sample MW-11 contains a significant amount of low-boiling petroleum hydrocarbons. GC/MS results indicate that the major portion of the petroleum hydrocarbons in this sample consists of saturated aliphatic hydrocarbons. There are normal alkanes in the range of nine to 12 carbon atoms ($\text{C}_9 - \text{C}_{12}$) with a maximum amount at 10 or 11 carbon atoms ($\text{C}_{10} - \text{C}_{11}$). Most of the saturated aliphatic hydrocarbons are branched alkanes.

Sample MW-26 does not contain a significant amount of low-boiling petroleum hydrocarbons. GC/MS results indicate that the major portion of the petroleum hydrocarbons in this sample consists of alkylbenzene or aromatic compounds. These aromatic compounds include alkyl branches ranging from three to five carbon atoms in length on a benzene ring. There are also saturated aliphatic hydrocarbons, with the n-alkanes in the same nine to 12 carbon range ($\text{C}_9 - \text{C}_{12}$) as found in sample MW-11. The ratio of branched alkanes to n-alkanes in sample MW-26 is higher than that observed in MW-11. The interpretation of this result is that the petroleum hydrocarbons in MW-26 appear to be more biodegraded than the hydrocarbons found in MW-11. From the n-alkane pattern, both samples seem to be the same type of petroleum product.

The petroleum product or products represented by all of these samples appears to originate from a single petroleum product with differences accounted for by the extent of biodegradation.

In the February 2001 Work Plan to the NJDEP, Sherwin-Williams proposed an extensive investigation program to delineate the extent of the free-product plume. A copy of that work plan has been provided to US EPA.

SEDIMENT AND SURFACE WATER

See section 3.2.6.1 for discussion.

3.2.8.3.2 AEC II

SOIL

A total of 37 soil samples were collected and analyzed from AEC II. Table 3-17 presents the frequency of compound detection, and the range and average concentration of the detected compounds.

Lead, arsenic, and xylenes were detected at concentrations above the SSCC. However, the concentrations of lead and arsenic were generally comparable to the value of the criteria, except for TB-67 where lead was detected at concentration of approximately 2.5 times the SSCC at 1.5 to 2.0 ft BGS. Lead was detected in groundwater at concentrations just above the GWQS. Since collection of these samples predates the low flow methods, it is likely that these low concentrations are the results of fines entrained in the groundwater samples. Therefore, it appears that lead in the soil column would not be impacting groundwater.

VOC analysis results for TB-91 through TB-93 indicated that no action level exceedances occurred for xylenes, toluene, ethylbenzene, and benzene in any of the soil boring samples. Therefore, delineation for these compounds has been completed.

In the February 2001 Work Plan to the NJDEP, Sherwin-Williams proposed additional soil sampling and analysis to complete delineation. A copy of that work plan has been provided to US EPA.

GROUNDWATER

A total of 21 groundwater samples were collected and analyzed from AEC II. Table 3-18 presents the frequency of analyte detection, and the range and average concentration of the detected analytes.

Lead, methylene chloride, and PCP were detected at concentrations above the GWQS in the shallow saturated zone. Deep wells were not installed in this area. PCP exceeded standards in MW-16 and MW-17, while lead exceeded the standard only in MW-17 and MW-18. Methylene

chloride concentrations are generally consistent, although these detections may be attributed to laboratory contamination. One Hydropunch sample collected at SGW-278 exceeded the xylene standard by approximately 35%.

The pre-1999 analyses had elevated MDLs that could not resolve concentrations at the GWQS level (1 ug/l). The 1999 analyses were conducted using a more sensitive method that allowed for the necessary resolution. Concentrations at MW-18 are currently above the GWQS.

	12/05/1991	01/07/1992	08/05/1993	09/08/1993	11/11/1996	02/05/1999
MW-16	50 U	2 J	25 U	25 U	Not Sampled	0.10 U
(Duplicate)			25 U			
	12/05/1991	01/07/1992	08/05/1993	09/08/1993	11/11/1996	
MW-17	17 J	18 J	17	17	55 U	
(Duplicate)	17 J	19 J			9 J	
	12/05/1991	01/07/1992	08/05/1993	09/08/1993	11/11/1996	02/05/1999
MW-18	55 U	50 U	25 U	25 U	Not Sampled	2.0
(Note: concentrations in ug/L)						

Generally, contaminated groundwater is limited to a narrow band defined by monitoring wells MW-17 and MW-18.

Additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. The proposed activities included the installation of shallow and deep wells and collection of groundwater samples.

3.2.8.3.3 AEC IV

FORMER POND SURFACES

In the first three phases of the RI, sampling in AEC IV was limited to groundwater. At the request of NJDEP, soil sampling was performed as part of the Phase IV RI to confirm that the 1979 remediation effort adequately removed sludges from the lagoons/pits. In addition, native soils immediately below the former lagoons/pits were sampled for analysis to determine whether residual contamination remains at present.

A total of six subsurface soil samples were collected and analyzed from AEC IV. Table 3-19 presents the frequency of analyte detection, and the range and average concentration of the detected analytes. Observations made during the drilling of the six borings, which were placed in the center of each former lagoon/pit, confirmed that the sludge had been removed. Chemical analysis of the samples collected below the former lagoons/pits did not identify any compounds exceeding the SSCC with the exception of PCP. PCP was detected in all six samples collected, but at very low concentrations (<1 mg/kg) except in samples SS-HP and SS-P2. In those two

samples, the concentrations were above SSCC (see Table 5-3). Due to the depth of the former lagoons/pits (or at least due to the extent of the 1979 removal action), the first native soils were located below the water table. Therefore, all six samples were collected below the water table. Collection of further soil samples is not proposed at this time but may be revisited as previous data is being reviewed in conjunction with new data collected and analyzed for all of the sites during the RI/FS process. However, the presence of PCP in the saturated zone in this area is currently proposed to be addressed as part of any groundwater remediation program and noted in documentation initially provided to NJDEP.

GROUNDWATER

A total of 33 groundwater samples were collected and analyzed from AEC IV. Table 3-20 presents the frequency of analyte detection, and the range and average concentration of the detected analytes

PCP, benzene, xylenes, and lead were detected at concentrations above the GWQS (Table 5-6). The overall data set indicates that lead concentrations have remained consistent or have decreased with time. Concentrations of organic compounds have remained generally consistent or have decreased with time.

Although AEC IV is located downgradient of AEC I/III, it does not appear to be impacted, to any great extent, by contaminated groundwater migrating from AEC I/III to AEC IV. Monitoring well MW-3, located at the upgradient end of AEC IV, shows a slight decrease in contaminant concentrations, which would not be consistent with an upgradient plume entering this AEC.

Monitoring well MW-38 was installed downgradient of MW-23 in the area between MW-23 and Bridgewood Lake to delineate the southern extent of the shallow groundwater plume. Except for PCP, no other compounds were detected above the GWQS. While some BNA compounds had MDLs elevated above the GWQS, the MDLs were less than an order of magnitude above the standards, and had any of these compounds been present, they would have been reported as estimated ("J" flag).

Since the southernmost extent of PCP in the shallow groundwater has not been fully delineated, additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. These activities included the installation and sampling of groundwater monitoring wells.

Degradation of Pentachlorophenol

Groundwater samples collected from monitoring well MW-23 over a period of time indicate PCP concentrations have been declining. PCP was also detected at MW-38, suggesting that while concentrations are declining, the plume may be discharging to Bridgewood Lake. However, the

concentrations are low, and an impact to the lake is not expected. In addition, given a seepage velocity of 0.03 ft/day and a distance of approximately 200 ft between MW-23 and MW-38, the travel time from MW-23 to MW-38 would be approximately 20 years. The decline of PCP concentration observed in MW-23 is too rapid to be attributed only to plume migration. Instead, biodegradation appears to be a major factor in the decline of PCP concentrations, as detailed by the accompanying table.

	09/23/1993	10/07/1993	11/07/1996	02/04/1999	02/04/1999	02/15/2000
MW-23	1400	1900	740 JD	94	110	69
				02/04/1999	03/24/1999	02/15/2000
MW-38				5 J	47 U	2.6
(concentrations in ug/l)						

To complete the PCP delineation and evaluate whether Bridgewater Lake is being impacted, additional investigations were proposed in the February 2001 Work Plan to the NJDEP, a copy of which has been provided to US EPA. The proposed activities included the installation and sampling of an additional monitoring well and the collection and analysis of sediment and surface water samples from Bridgewood Lake

3.3 PRELIMINARY IDENTIFICATION OF ARARS AND TBCS

3.3.1 Potential Applicable or Relevant and Appropriate Requirements

The following federal and state regulatory requirements are potentially applicable or relevant and appropriate to the site:

(1) Chemical-Specific

- Federal
 - Resource Conservation and Recovery Act (RCRA)-Maximum Concentration of Constituents for Groundwater Protection (40 CFR 264.94).
 - Federal Safe Drinking Water Act-Maximum Contaminant Levels (40 CFR 141.11-.16, and .60-.63).
 - National Ambient Air Quality Standards (NAAQSs) (40 CFR 50).
- New Jersey State
 - New Jersey Water Pollution Control (NJAC 7:9).

- New Jersey Surface Water Quality Standards (NJAC 7:9B).
- New Jersey Safe Drinking Water Act Rules (NJAC 7:10).
- New Jersey Air Pollution Control Rules (NJAC 7:27).
- Ground Water Quality Standards (NJAC 7:9).
- Technical Requirements for Site Remediation (NJAC 7:26E)

(2) Location-Specific

- Federal
 - Endangered Species Act (16 USC 1531 et seq.). (Requires that action be performed to conserve endangered species or threatened species).
 - Fish and Wildlife Coordination Act (16 USC 661 et seq.). (Requires actions to protect fish or wildlife when diverting, channeling, or modifying a stream).
 - Federal Water Pollution Control Act (FWPCA) (33 USC 1521 et seq.). (Requires a permit from the Corps of Engineers and consideration by both the US EPA and the Fish and Wildlife Service before an application to dredge and fill may be enacted).
 - National Historic Preservation Act.
- New Jersey State:
 - New Jersey Endangered Plant Species Program (NJAC 7:5C).
 - New Jersey Freshwater Wetlands Protection Act Rules (NJAC 7:7A).
 - New Jersey Flood Hazard Area Control (NJAC 7:13).
 - New Jersey Division of Fish, Game, and Wildlife Rules (NJAC 7:25).
 - New Jersey Industrial Site Recovery Act.

(3) Action-Specific

- Federal
 - RCRA Criteria for Classification of Solid Waste Disposal Facilities and Practices (40 CFR 257).
 - RCRA Standards Applicable to Generators of Hazardous Waste (40 CFR 262).
 - RCRA Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 264).
 - RCRA Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities (40 CFR 265).
 - RCRA Land Disposal Restrictions (40 CFR 268).
 - Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR 230).
 - Clean Water Act – NPDES permitting requirements for discharge of treatment system effluent (40 CFR 122-125).
 - Safe Drinking Water Act, Underground Injection Control Requirements (40 CFR 144 and 146).
 - DOT Rules for Hazardous Materials Transport (49 CFR 107, 171.1-172.604).
 - Occupation Safety and Health Standards and Safety and Health Regulations for Construction (29 CFR 1910 and 1926).
- New Jersey State:
 - Discharges of Petroleum and Other Hazardous Substances (NJAC 7:1E).
 - New Jersey Worker and Community Right-to-Know Regulations (NJAC 7:1G).
 - New Jersey Storm Water Management Rules (NJAC 7:8).
 - Licensing of Water Supply and Wastewater Treatment System Operators (NJAC 7:10A).

- New Jersey Water Pollution Control Act Regulations (NJAC 7:14).
- New Jersey Pollutant Discharge Elimination System Rules (NJAC 7:14A).
- Underground Storage Tanks (NJAC 7:14B).
- New Jersey Water Quality Management Planning (NJAC 7:15).
- Regulations Governing the Certification of Laboratories and Environmental Measurements (NJAC 7:18).
- Water Supply Allocation Permits (NJAC 7:19).
- Water Resource Management (NJAC 7:21).
- New Jersey Solid Waste Rules (NJAC 7:26).
- New Jersey Recycling Rules (NJAC 7:26A).
- New Jersey Technical Requirements for Site Remediation (NJAC 7:26E).
- New Jersey Hazardous Waste Rules (NJAC 7:26G).
- New Jersey Air Pollution Control Rules (NJAC 7:27).
- New Jersey Noise Control Rules (NJAC 7:29).
- New Jersey Brownfield and Contaminated Site Remediation Act (P.L. 1997, C. 278).

3.3.2 “To Be Considered”

When ARARs do not exist for a particular chemical or remedial activity or when the existing ARARs are not protective of human health or the environment, other criteria, advisories, and guidance may be useful in designing and selecting a remedial alternative. The following criteria, advisories, and guidance were developed by federal, state, and other agencies.

- Federal:
 - Safe Drinking Water Act-National Secondary Drinking Water Regulations (40 CFR 143).

- Safe Drinking Water Act-Maximum Contaminant Level Goals (40 CFR 141.50-.52).
- Proposed Safe Drinking Water Act-Maximum Contaminant Levels and Maximum Contaminant Level Goals (53 FR 31516).
- Proposed Safe Drinking Water Act-Maximum Contaminant Levels, Maximum Contaminant Levels (54 FR 22064).
- US EPA Quality Criteria for Water 1986, US EPA 440.5-86-001, May 1986.
- Proposed Federal Air Emission Control Standards for Volatile Organic Control Equipment (52 FR 3748).
- “Control of Air Emissions from Superfund Air Strippers”, US EPA OSWER Directive 9355.0-28.
- Proposed Requirements for Hybrid Closures (combines waste-in-place and clean closures) (52 FR 8711).
- US EPA Drinking Water Advisories.
- Policy for the Development of Water Quality-Based Permit Limitations for Toxic Pollutants (49 FR 9016).
- Groundwater Classification Guidelines.
- Groundwater Protection Strategy.
- Waste Load Allocation Procedures.
- US EPA’s 1985 “Statement of Policy on Floodplains/Wetlands Assessments for CERCLA Actions”.
- Fish and Wildlife Coordination Act Advisories.
- Section 404 - Clean Water Act, as it pertains to wetlands.
- Executive Order 11988 Floodplain Management.
- Executive Order 11990 Protection of Wetlands

- New Jersey State
 - New Jersey Department of Environmental Protection Oversight of the Remediation of Contaminated Sites (NJAC 7:26).
 - New Jersey Soil Cleanup Criteria.
 - New Jersey Department of Transportation Standard Specifications – Soil Erosion and Sediment Control Measures (1996).

3.4 PRELIMINARY IDENTIFICATION OF REMEDIAL ACTION ALTERNATIVES

3.4.1 Preliminary Identification of Remedial Action Objectives

Remedial action objectives consist of medium-specific or operable unit-specific goals for mitigating the risks to public health and environmental quality from the site. For example:

- Groundwater – Remediate contaminated groundwater so that ARARs and/or risk-based levels are attained at the completion of the remedial action.
- Soils – Prevent or reduce exposures to contaminated soil such that the excess risk from exposure is within acceptable levels.
- Surface water/sediment – Prevent or reduce exposure to contaminated surface water and sediment such that the excess risk from exposure is within acceptable levels.
- Prevent contaminant migration from soils and sediments into groundwater and surface water bodies.

3.4.2 Preliminary Identification of General Response Actions, Remedial Technologies, and Alternatives

To achieve the preliminary remedial response objectives set forth in Subsection 3.4.1, a set of general response actions is identified for the site. These general response actions fall into the following categories:

- No action.
- Source control actions.

- Migration control actions

A preliminary list of response actions and remedial alternatives for specific media is presented below. This preliminary list is intended to provide a starting point for the FS. This list will be modified during the FS.

During identification of remedial technologies consideration will be given to federally listed threatened plant species (swamp pink) present at the site. Additionally, if any intrusive remedial technologies are selected, a survey will comply with the requirements set forth in the swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). If and when this survey is required, the US EPA will be given sufficient notice so that US EPA representatives may arrange to be present at the time of the survey.

In the event that any proposed remedy will involve the discharge of treated groundwater into any surface water body Sherwin-Williams is aware that one of the following chemical ARARs, dependent upon the specific contaminant, may be appropriate:

- 1) A technology based limit, or
- 2) A surface water quality based limit, or
- 3) An antidegradation based limit.

Sherwin-Williams is aware that the determination of the correct chemical ARARs will also require upstream and downstream surface water sampling in accordance with the 13 April 1992 Memo of Understanding (MOU) between the US EPA and the NJDEP entitled *Determination of Surface Water Discharge ARARs for CERCLA On site Response Actions*. This MOU will be followed for the surface water sampling conducted at the sites associated with this RI/FS. In the event that ambient water quality is better than the applicable water criteria but the surface water discharge increases the ambient concentration, an antidegradation based limit will be established after an approved antidegradation demonstration is completed. Antidegradation criteria will be developed and presented to the US EPA and NJDEP as necessary, based on the selection of proposed remedial options.

During identification of remedial technologies, consideration will be given to the wetlands associated with the sites. In the event that an intrusive remedial technology is selected for a site where a wetland survey has not been completed, a wetland survey will be conducted in accordance with NJDEP guidelines along any water bodies of interest. The New Jersey Freshwater Wetland quarter-quadrant maps and the Camden County Soil Survey will be used to supplement the National Wetland Inventory (NWI) maps and field reconnaissance conducted as part of any wetland survey.

3.4.2.1 Soil Treatment and Disposal

The remediation of contaminated soils at the site can be addressed by either excavation and on site or off site treatment/disposal, or in situ treatment. A brief discussion of the remedial technologies/alternatives is provided in the following subsections.

3.4.2.1.1 Excavation and On site or Off site Treatment /Disposal

On site/off site treatment technologies may include soil washing or chemical fixation. The treated soil can then be disposed of by either land filling off site or using it as backfill on site.

Soil washing requires chemical and physical processes. In a chemical process, solvent extraction methodologies remove contaminants (metals and organics) from the soil. Physical processes begin with classification of the contaminated soil prior to extraction. Excess moisture is removed from treated soil after extraction, and spent solvent is recovered. The wastewater generated from soil washing is typically treated in an on site water treatment system.

Chemical fixation involves the addition of siliceous material combined with setting agents such as lime or cement, resulting in a stabilized and solidified product. Commercial proprietary fixation agents and processes can be used for both inorganic and organic contaminated soils.

3.4.2.1.2 In-Situ Treatment

Technologies capable of treating contaminated soil in place are discussed below. These technologies include soil flushing, solidification, and phytoremediation.

Soil flushing washes contaminants from the in situ soil with a suitable solvent such as water or a surfactant solution. The contaminated elutriate is collected and pumped to the surface for removal, resource recovery and recirculation, or subsequent on site treatment and reinjection.

In situ stabilization/solidification uses a mechanical mixer/injector to introduce and mix fixation materials directly into the contaminated subsurface materials. The soil is eventually solidified.

Phytoremediation involves application of the ability of certain plants to uptake and fix various contaminants. The plants are periodically harvested and disposed.

3.4.2.2 Groundwater Treatment and Disposal

Contaminated groundwater at the site can be pumped and treated on site or treated in-situ.

3.4.2.2.1 On site Treatment /Disposal

On site treatment technologies involve air stripping or chemical oxidation for removing volatile organics and carbon adsorption, chemical oxidation, biological treatment, and reverse osmosis

for removing non-volatile organics. Chemical precipitation, ion exchange, and reverse osmosis can be used for removing inorganics.

Air stripping is a mass-transfer process in which volatile organic contaminants in groundwater are transferred to the vapor phase. Generally, organic compounds with a Henry's Law constant of greater than 0.003 atm-m³/mol are volatile enough to be effectively removed by air stripping. Air stripping is an efficient process to treat groundwater contaminants with relatively high volatility, low water solubility (e.g., chlorinated hydrocarbons such as tetrachloroethylene) and aromatics (such as toluene). Liquid-phase activated carbon is often used to remove residual compounds following air stripping. Vapor-phase activated carbon is often used to capture vapor emissions from the air stripper.

The process of adsorption onto activated carbon involves contacting a waste stream with the carbon, usually by the stream flowing through a series of packed bed reactors. The activated carbon selectively adsorbs hazardous constituents from the waste stream as the organic molecules are attracted to the internal pore surfaces of the carbon granules. Activated carbon can be used for the adsorption of volatile and semivolatile organic contaminants from the groundwater.

Chemical precipitation or ion exchange can be used to remove the metals. Chemical precipitation is a pH adjustment process in which acid or base is added to adjust the pH to a level where the constituents to be removed have their lowest solubility. Metals can be precipitated from solution as hydroxides, sulfides, carbonates, or other insoluble salts. Hydroxide precipitation with lime is most common, although sodium sulfide is sometimes used to achieve lower effluent metal concentrations. The resulting residuals are metal sludge and the treatment effluent, which has an elevated pH and (in the case of sulfide precipitation) excess sulfides. These sludges require appropriate handling and disposal.

Ion exchange is a process whereby selective ions are removed from the aqueous solution and replaced by less harmful ions held by ion exchange resins. Reverse osmosis can be used to remove dissolved solids, including sodium, to meet drinking water standards. In normal osmotic processes, solvent will flow across a semi-permeable membrane from a diluted concentration to a more concentrated solution until equilibrium is reached. The application of high pressure to the more concentrated side of the membrane will cause this process to reverse. This results in solvent (e.g., water) flow away from the contaminated solution, leaving a more concentrated solution of contaminants. The water passing through the reverse osmosis membrane has, therefore, been "filtered" of contaminants. The concentrated solution of contaminants is then disposed of appropriately.

3.4.2.2.2 In-Situ Treatment

In-well treatment, reactive barriers and monitored natural attenuation can be used for the removal of organic and inorganic compounds.

In-well treatment involved the use of recirculating well technology coupled with the use of a mass-transfer removal method, such as air stripping or ion-exchange. The recirculating well sets up a closed circulation loop where groundwater is cycled from the formation through the treatment system and returned to the formation. In addition to treatment, this method provides hydraulic control for off site migration.

Reactive barriers are constructed from zero-valence iron fillings (often amended with catalysts), or other appropriate material (such as a substrate that enhances biological activity) and is positioned across the path of groundwater flow. As groundwater flow through the reactive barrier, the contaminants react with the barrier medium and are neutralized, and treated water exits the barrier.

3.4.2.3 Sediment Dredging/Dewatering/On-Site or Off-Site Disposal

This consists of dredging contaminated sediments, dewatering the dredged sediments, on-site or off-site disposal, and site restoration. Contaminated sediments may be removed using conventional excavation and/or dredging techniques. Appropriate measures are implemented to control contaminant migration from sediments. In addition, excavation and/or dredging activities are typically scheduled during low flow periods. Specific details for dredging/excavation and sediment erosion control would be developed further during the Remedial Design stage. Dredged/excavated contaminated sediment are typically managed based on characterization after dredging/excavation. The resulting excavated contaminated sediments would be disposed off-site or on-site after any appropriate treatment of the contaminated sediments, if necessary, to meet applicable disposal requirements. To improve material handling, the dredged materials may be dewatered prior to on-site disposal or being transported off-site for disposal at an appropriate disposal location. Water recovered from the dewatering operation are treated and disposed to meet applicable requirements. Dredged/excavated areas would be restored to original conditions by placement of clean material suitable for re-establishment of wetlands and/or benthic communities.

3.4.2.4 Monitored Natural Recovery

Monitored Natural Recovery (MNR) includes a variety of processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in the sediment bed. These natural processes include the following:

- Physical processes (e.g., sedimentation, advection, diffusion, dilution, bioturbation, volatilization);
- Biological processes (e.g., biodegradation, biotransformation, phytoremediation, biological stabilization); and

- Chemical processes (e.g., oxidation/reduction, stabilization, sorption).

These processes interact in aquatic systems, sometimes reducing risks and at other times, increasing them. Understanding the interactions between effects and prioritizing the significance of these effects to the MNR remedy would be part of the FS.

3.4.2.5 In-Situ Capping

In-situ capping refers to the placement of a subaqueous covering or cap of clean material over a deposit of contaminated sediment. Caps are generally constructed of granular material, such as clean sediment, sand, or gravel. A more complex cap design can include geotextiles, liners, and multiple layers as well as additions of material to attenuate the flux of contaminants (e.g., organic carbon). Depending on the contaminants and sediment environment, a cap reduces risk through the following primary functions:

- Physical isolation of the contaminated sediment from the aquatic environment;
- Stabilization/erosion protection of contaminated sediment, preventing resuspension and transport to other sites; and
- Chemical isolation/reduction of the movement of dissolved and colloiddally transported contaminants.

Caps may be designed with different layers to serve these primary functions or in some cases a single layer may serve multiple functions. Variations of in-situ capping include installation of a cap after partial removal, through dredging or excavation, of contaminated sediment, and innovative caps, which incorporate treatment components.

Capping is sometimes considered following partial sediment removal where capping alone is not feasible due to hydraulic or navigation restrictions on the waterway depth, or where it is desirable to leave deeper contaminated sediment in place to preserve bank or shoreline stability following hot spot removals. Backfill of clean material which is designed to mix with dredging residuals rather than act as a engineered cap to isolate buried contaminants is not considered in-situ capping in this guidance.

SECTION 4.0

WORK PLAN RATIONALE

4.1 CONCEPTUAL SITE MODEL

Based on the information collected during the investigations at the sites and at the Paint Works, a conceptual site model has been prepared, which describes the general hydrogeologic and contaminant behavior framework.

The sites are located in the New Jersey Coastal Plain Geomorphologic Province, within a sub-basin of the Cooper River drainage system.

The following major stratigraphic units were identified at the sites:

- Reworked native soils and fill.
- Tan/Gray Silty Sand.
- Black/Green Silt.
- Gray/Bluish-Green Silty Sand.

The thickness of reworked native soils and fill is between 10 to 20 feet, depending upon topography and emplacement or removal of fill. This unit is composed of silty sands or wastes that are devoid of sedimentary structure. The uppermost reworked sands are probably derived from the Pennsauken Formation.

The reworked native soils are underlain by less compacted silty sands and silts. These units (tan/gray silty sand and tan/brown/gray silt) are approximately 20 feet thick, and bedding structures can often be seen in the samples. The underlying black/green silt is approximately 5 feet thick. This unit separates the shallow from the deep saturated zone and is underlain by a 5-foot-thick fossiliferous zone. It appears that the undisturbed sequence belongs to the Kirkwood Formation. It is likely that the deep saturated zone represents the Vincentown-Manasquan Formation.

The top of the deep saturated zone is marked by the presence of the 5-foot thick fossiliferous zone. The sediments of the fossiliferous zone are loose, and the fossils impart a higher degree of porosity, compared to the underlying and overlying fine-grained silty sands. The underlying gray/bluish green silty sand is dense (well compacted). The total thickness of this unit was not penetrated by borings during the investigations. With depth, this unit may locally become cemented and contain lenses or layers of fossils. The lithological contacts are subhorizontal.

Two groundwater zones, one shallow and one deep, were identified during the course of the investigations at the Paint Works and the United States Avenue Burn Site. No wells were installed in any of the other sites or areas. The shallow water table generally slopes toward the nearby surface water bodies. Groundwater elevation data indicates that groundwater supports flow within the surface water bodies on a seasonal basis. The exception is the channeled portion of Hilliard Creek, which, due to manmade conveyance, either does not receive groundwater flow or receive limited groundwater flow. The deeper groundwater zone was investigated only in the vicinity of the Paint Works. In that area, groundwater flow is to the south-southwest.

The water table is generally encountered at approximately 3 to 20 feet BGS. Localized groundwater mounds were identified and are believed to be the result of manmade conditions including active septic systems at the Paint Works. Most of the shallow groundwater discharges to Hilliard Creek and Bridgewood Lake, and the rest migrates vertically to the deeper saturated zone. The deep groundwater zone is separated from the shallow zone by a low-permeability silt unit, which appears to be acting as a confining layer. The vertical groundwater flow direction is from the shallow to the deep zone.

The extent of the contaminant plume in the shallow groundwater zone appears to be relatively stable with time. This stability is attributed to a combination of the low horizontal groundwater flow velocity and the fact that many of the detected contaminants (hydrocarbons) are generally amenable to biodegradation. Contaminant concentrations are decreasing with time. While the nature of the deeper groundwater plume has been defined, there is not enough data to evaluate its behavior with time. It is expected that compounds with a high solubility or a small affinity for adhering to soil particles will migrate to the deeper aquifer.

The regional production aquifers are well below this low-permeability silt zone. Precipitation infiltrates into the soils or runs off into the various natural and man-made streams and lakes that traverse the area. The well-developed vegetative cover provides a large transpiration potential. The fraction of the precipitation that does not run off or evaporo-transpire recharges the water table. A portion of the water table groundwater discharges to the various surface water bodies and a portion is available for downward migration. However, since surface elevation is very close to the base level, the potential for vertical migration is low. Vertical migration is further impeded by the various silt and clay units. Groundwater in the deeper unit (which likely originated in updip recharge areas) ends up in the regional discharge zones. The vertical gradient between the water table and deeper zone is expected to be neutral or slightly downward.

The soil, groundwater, sediment and surface water contamination present at the sites has most likely resulted from a variety of historic and current activities at these sites. Based on the types of contaminants identified and their locations within the sites, Sherwin-Williams has identified the following activities that may have caused releases of contaminants to the environment. Other activities or sources may also exist, but to date, have not been identified.

Route 561 Dump Site

- Disposal of wastes and/or demolition debris; and
- Septic system and other discharges related to the adjacent site.

United States Avenue Burn Site

- Disposal of plant wastes;
- Disposal of municipal wastes; and
- Illegal residential dumping.

White Sand Branch

- Transport of contaminated sediments from the Route 561 Dump Site, the United States Avenue Burn Site and suspected illegal dumping along the waterway.

Haney Run

- Transport of contaminated sediments from the United States Avenue Burn Site.

Bridgewood Lake

- Discharge from White Sand Branch.

Hilliard Creek

- Transport of contaminated sediments from the Paint Works; and
- Discharges from the seep area.

Although not a site currently covered by the AOC the following sources have been identified at the Paint Works:

- Storage and handling of materials in former Tank Farm A.
- Releases in the vacant parcel north of former Tank Farm A, in the former resin manufacturing area.
- Historic storage and handling of materials in the storage and loading area now referred to as the Seep Area.
- Storage and handling of wastewater and sludge in the former lagoon area.
- Releases to the near-surface soils from manufacturing and shipping in the area immediately north of Foster Avenue.

Additional potential sources raised by Sherwin Williams:

- Storage, handling, and releases of petroleum products at the former gasoline service station.
- Discharges to septic systems.

- Discharges of waste oils to the ground surface adjacent to the Police Station (via surface discharges and floor drain).
- Storage of hazardous materials and hazardous waste adjacent to the Police Station, by the former Academy Paints.

Contaminant sources identified at the sites include residual waste materials, contaminated soils, contaminated groundwater, and free phase product. Any materials that are exposed at the ground surface may be available for transportation into the surface water either by erosion or re-deposition. These materials would also be available for direct contact with people and wildlife. For those portions of the sites that have been fenced-off to limit access, human contact is limited to occasional trespassers. Human contact may include adult and child residents, commercial/industrial workers, recreational users, and trespassers along Hilliard's Creek and for some portions of the other water bodies being investigated. Since the United States Avenue Burn and Route 561 Dump Sites are undeveloped lots, any future development would be restricted by their proximity to wetlands and zoning requirements. Future development along the various water bodies will also be limited in some cases due to wetlands and any potential acquisition or conservation easements of lots as part of the Borough of Gibbsboro's Greenway Plan to preserve open space. However, many portions of Hilliard's Creek south of the Paint Works Corporation Center are zoned residential with many residential properties already existing along the waterway with a portion zoned as an industrial district while portions near the Paint Works Corporation Center are primarily zoned as an Office Technical Park with a small portion designated as a residential district. A mixture of residential and office residential are zoned for the areas surrounding Bridgewood Lake, Haney Run Brook and White Sand Branch.

Precipitation percolating through contaminated soils may mobilize contaminants to the water table. Contaminated groundwater in the water table zone is expected to migrate primarily in a horizontal direction. Locally, groundwater may discharge into surface water bodies. In the absence of pumping vertical groundwater flow is negligible, since the vertical gradients are practically zero. Groundwater pumpage for municipal use is confined to deeper aquifers. Contamination of the shallow saturated zones is not expected to impact deeper zones.

Wastes that enter the surface water system are transported downstream until they are deposited in one of the many sediment sinks. There are many wetland areas around the lakes and streams that can act as sediment sinks. Because of the overall low gradient of the area, many depositional zones are expected to exist along the course of these streams. Dammed runs and lakes (often formed by the damming of the streams) create additional depositional areas. Because the streams often run through undeveloped lots, they, and their adjoining wetlands, have often been used by the locals as convenient areas for the disposal of demolition debris.

The following exposure routes may be available at a hazardous waste site:

- Inhalation of contaminants along with airborne dust from surficial soils, or from volatilization of contaminants from soil or water.
- Ingestion of contaminants as a result of eating soil or sediment, or contaminated fish, game, or plant material.
- Ingestion of contaminants from drinking groundwater or surface water in the immediate vicinity.
- Absorption of contaminants through the skin if a person were to fish, bath, or engage in contact recreation within contaminated waters.

Not all of these exposure routes may be present at each site, depending on the physical characteristics of each site, and the physicochemical characteristics of the contaminants of concern.

4.2 DATA QUALITY

To ensure that the right type, quality, and quantity of data are collected to satisfy the data user's needs, data quality objectives (DQOs) are developed following guidelines detailed in US EPA QA/G-4, *Guidance for the Data Quality Objectives Process*, US EPA/600/R-96/05, August 2000. DQOs are qualitative and quantitative statements that:

- Clarify the intended use of the data,
- Define the type of data needed to support the decision,
- Identify the conditions under which the data should be collected, and
- Specify tolerable limits on the probability of making a decision error due to uncertainty in the data.

While the objectives state what the data user's needs are, they do not provide sufficient information about how these needs can be satisfied. The verifiable measurement performance criteria must be established and must be satisfied to achieve the overall quality objectives.

A detailed discussion of quality objectives and criteria for measurement data can be found in the Quality Assurance Project Plan (QAPP), beginning with Section 4.0, developed by following US EPA QA/R-5, *US EPA Requirements for Quality Assurance Project Plans*, US EPA/240/B-01/.003, March 2001; and US EPA QA/G-5, *US EPA Guidance for Quality Assurance Project Plan*, US EPA/600/R-98/018, February 1998. One of the most important features of the QAPP is that it links the data user's quality objectives to verifiable measurement performance criteria. In QAPP, data quality indicators (DQIs) will be developed and used for data quality assessment criteria.

4.3 WORK PLAN APPROACH

The basic technical approach to the RI/FS at the subject sites is to characterize each location to the point where remedial alternatives can be developed and evaluated.

An iterative approach is proposed to obtain the required information. The currently available data suggest that conditions at the site are sufficiently complex that all necessary information should not be collected in a single event, to avoid undue waste of resources. However, there is enough information available to allow us to establish pre-determined decision points and to organize the data collection in stages that will minimize the number of iterations.

The approach envisioned by this work plan is:

1. Review existing data and identify data gaps.
2. Develop a sampling and analysis program based on statistical methods and professional judgment.
3. Implement sampling and analysis program.
4. Evaluate data statistically to determine whether an adequate dataset exists.
5. Evaluate data to determine whether delineation and characterization has been achieved.
6. Prepare a Screening Level Ecological Risk Assessment (SLERA) to evaluate whether additional data is necessary for a Base Line Ecological Risk Assessment (BERA).
7. If necessary, collect additional data to obtain statistically complete dataset and complete delineation and a characterization. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if "hot spots" are identified, or if delineation has not been completed.
8. Analyze the data and prepare RI, HHRA, BERA, and FS reports.

SECTION 5.0

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

5.1 MOBILIZATION

The mobilization subtask includes the planning and initial activities to support the field investigation. Mobilization activities will include the following:

- Site access
- Obtain necessary permits
- Clear site utilities
- Construct site facilities
- Establish sampling locations
- Mobilize equipment and supplies
- Field personnel orientation

5.1.1 Site Access

The properties under investigation are not owned by Sherwin-Williams. Therefore, access agreements must be established between Sherwin-Williams and the property owners. This activity has already been initiated.

5.1.2 Obtain Necessary Permits

Well and boring permits will be obtained by the driller.

Tree removal permits are required by the Borough of Gibbsboro for the removal of trees larger than 8 inches in diameter. Based on discussions with the Mayor of Gibbsboro, Sherwin-Williams anticipates the Borough will waive the requirement, if removal of large trees becomes necessary during the investigations.

The need for other permits is not currently anticipated.

5.1.3 Clear Site Utilities

Prior to any intrusive activities, such as drilling or excavating, on site buried utilities will be identified and "cleared." These utilities would include buried electrical lines, sewer and water lines, gas transmission lines, and telephone cables. Prior to initiating activities the "One Call" system will be activated. The appropriate local agencies will be contacted for any public utilities not participating in the "One Call" system.

5.1.4 Construct Site Facilities

An office trailer with electrical and telephone service is already available at The Paint Works site (located at 1 Foster Avenue).

Sanitary facilities will be installed, including a portable toilet and a trash dumpster. A decontamination and drum-storage area will be set up at each site, prior to initiating activities at each area.

At the Route 561 Dump Site and the United States Avenue Burn Site the decontamination and drum storage areas will be set up adjacent to the site gate, where there will be least interference with site activities. At the Railroad Track Site, the decontamination and drum storage areas will be setup behind (west of) the gate to the former lagoon area, located immediately to the north of the investigation zone. At the other sites, there are no permanent facilities that can be used as a staging area. At those sites, a portable decontamination facility will be utilized. This equipment will be moved from one location to the next, as work progresses along the streams. Cuttings and decontamination fluids will be stored at the United States Avenue Burn Site drum storage area.

5.1.5 Establish Sampling Locations

A pre-mobilization site walk-over will be conducted during the field investigation to inspect the surface conditions on the site with regard to access for heavy equipment and movement of trailers and drums. Discolored soils and/or areas suspected of containing contaminated materials will be noted for possible later sampling. Surface features will be described and located on a site base map, which will subsequently be used to locate wells, borings, and other sampling locations.

All sampling locations will be identified and staked prior to initiating the actual sampling activities. It is expected that the US EPA will provide a representative to approve these locations.

Soil boring locations will be located by Geographic Positioning System (GPS) with submeter accuracy (Trimble Pro-XL™ with real-time differential correction or equivalent). Monitoring wells will be surveyed by a State of New Jersey-licensed surveyor.

5.1.6 Mobilize Equipment and Supplies

This subtask will include all activities required to procure equipment and supplies and mobilize these items to the site.

5.1.7 Field Personnel Orientation

This activity will consist of an on site project briefing for each field team member for them to become familiar with the history of the site, the purpose of the investigation, health and safety requirements, quality assurance protocols, and field procedures. Subcontractors involved in field activities will also participate in an on site briefing prior to commencing field work.

Daily health and safety and field progress briefings will be held for the project team and subcontractor personnel conducted by the on site safety coordinator.

5.2 FIELD INVESTIGATION

The proposed sampling and analysis program will be conducted in an iterative mode. Additional data requirements and analyses may be identified throughout the process. Consequently, the Work Plan may be revised or an addendum incorporated into the Work Plan to conduct additional sampling of the media of interest. Sherwin-Williams understands they are responsible for fulfilling additional data and analysis needs identified by the US EPA. Detailed procedures for sample collection and analysis are presented in the FSAP and QAPP documents. All data collected at the sites was considered in developing the proposed scope of work. The Route 561 Dump site and the United States Avenue Burn site were gridded and sampled during previous investigations conducted under US EPA and/or NJDEP oversight. Samples were analyzed using Contract Laboratory Program (CLP) methods or X-Ray Fluorescence (XRF) methods verified by analyses by CLP methods. These techniques produced reliable data of known quality that can be easily integrated with the data that will be obtained by the proposed investigations, without concerns regarding the comparability of the datasets.

5.2.1 United States Avenue Burn Site

5.2.1.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil and groundwater contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted.

5.2.1.2 Soil

A topographic survey map of the site has already been completed (Figures 2-2 and 2-5). This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with submeter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

A systematic sampling grid will be established starting at the White Sand Branch and Haney Run Brook water bodies and extending outwards in an east/northeast/southeast direction. For Haney Run Brook, the grid will extend 150 feet to the approximate break of topographic slope (Figure

5-1). For the segment of the systematic sampling grid encompassing White Sand Branch, it shall extend in a southerly direction slightly past the convergence with Haney Run Brook (approximately 30 feet past sampling point 122 on Figure 5-1) and shall extend outwards 150 feet past the current fence line. A similar grid will also be established extending outwards 150 feet from the northern and southern fence lines. The grid nodes will be spaced 50 feet apart. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if “hot spots” are identified, or if delineation has not been completed.

As requested by the US EPA, additional soil borings will be drilled and sampled between the following 1995 grid locations (Figure 5-1):

3 & 9	4 & 5	5 & 12
5 & 48	15 & 21	18 & 25
21 & 27	23 & 24	31 & 26
37 & 38	49 & 3	6 & 7
7 & 14	8 & 109	103 & 104
106 & 1	107 & 48	108 & 116
108 & 49	109 & 126	115 & 515
118 & 105	120 & 118	121 & 526
127 & 116	501 & 505	509 & 516
520 & 532	527 & 516	542 & 543
544 & 548	545 & 527	518 & 529

Soil sampling will also be conducted along United States Avenue’s eastern side right-of-way across from borings 15, 3, 49, and 116 (Figure 5-1).

Soil sampling will also be conducted along the southeast and southwest perimeters of the Landfill Area. Five locations will be to the southwest of MW-10 and sampling points 546 and 548. Soil sampling to the southeast of the landfill area will be conducted between points 520 & 521; 511 & 504; and 521 & 514.

Soil samples will be collected at three intervals at each location specified above: one from the ground surface to approximately 24 inches BGS depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one 6 inches above the water table; and one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

The existing analytical data indicate that metals were detected in most of the samples collected to date. All samples will be analyzed for TAL parameters. In addition, 30% of the samples will also be analyzed for TCL parameters (VOCs, SVOCs, Pesticides/Herbicides, PCBs). Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Lastly, all soil and sediment sampling locations that are situated on residential properties will be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. As agreed with the US EPA, prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

5.2.1.3 Groundwater

There are four wells in the landfill area of the United States Avenue Burn site. These are shallow wells, completed in the water table zone. To assist delineation, groundwater samples from the water table zone will be collected for screening, utilizing a Geoprobe system. Samples will be collected from approximately 2 feet below the water table. The screening will cover the perimeter of the landfill area (see Figure 5-1). Two additional groundwater-sampling points will be co-located with sampling points 23 and 25. The additional groundwater-sampling locations will be sampled within both the shallow (water table) and deep saturated zones. Based on the results of the screening sampling investigation and review of previous sampling results, additional water table wells may be installed.

To investigate groundwater quality in the deeper zone, additional screening points will be installed in the vicinity of the existing monitoring wells. Data from existing monitoring well MW-40 suggest that the deeper saturated zone occurs approximately 60 feet below grade. The screening samples will be collected approximately 2 feet below the top of the deep saturated zone. Based on the results of the screening investigation and review of any previous sampling results, one or more permanent wells screened in the deeper zone will be installed. If the screening investigation suggests that groundwater contamination is not present, then one well will be installed downgradient of the former landfill area. If contamination is detected, the number and location of wells will be determined based on the screening results.

There are no wells in the burn area of the United States Avenue Burn site. The results of the screening investigation conducted for The Paint Works under NJDEP oversight suggest that groundwater underlying this area is contaminated with VOCs. Three wells will be installed in the water table zone: one well will be installed along the northern property line and two wells will be installed along White Sand Branch (Figure 5-1).

The existing groundwater screening results suggest that contamination is present in the deeper zone in the upgradient (northern) portion of the site, but it does not extend beyond the confluence of White Sand Branch and Haney Run Brook by United States Avenue (monitoring

well MW-40). Therefore, the installation of one monitoring well, screening in the deep zone is proposed at this time. This well will be installed near the northern site property line, near United States Avenue. In conjunction with MW-40 and MW-39 (located across United States Avenue) it is expected to provide adequate definition of groundwater flow direction and extent of contamination. Additional wells may be installed, if necessary, after the initial rounds of analytical results and previous sampling results have been reviewed.

The screening samples will be analyzed for 100% of the TCL/TAL parameters using a two-week expedited turnaround time.

Only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite). Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using "low-flow" methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

As part of the groundwater investigation, the well of the residence at 25 United States Ave. will be sampled and analyzed for 100% of the TCL/TAL parameters.

Groundwater samples will be collected using low-flow methods, except for the residential well, which will be sampled at the tap. When possible, pre-cleaned dedicated sampling equipment will be utilized. When that is not possible, equipment will be decontaminated between samples. Decontamination procedures specified in the US EPA Region 2 Low-Flow SOP (Appendix B of SAP) will be followed as part of the method for collecting low flow ground water samples.

All new and existing wells will be slug-tested. In addition, one water table and one deeper well will be pump tested. The selection of the pumped and observation wells will be based on the results of the slug test and hydrogeologic information collected during the investigation.

To assist with the development of a groundwater flow model, monthly groundwater elevation measurements will be collected from all existing and new wells, for a period of 6 months. To evaluate the relation between surface water and groundwater, gauging stations will be established along White Sand Branch and Haney Run Brook, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements. Stream flow measurements will be collected in accordance with industry standards.

5.2.1.4 Sediment

See discussion under White Sand Branch.

5.2.1.5 Surface Water

See discussion under White Sand Branch.

5.2.1.6 Ecological Assessment

A wetland delineation has been completed at this site (Appendix D) and it may be updated as needed. This delineation includes portions of Haney Run and White Sand Branch.

A preliminary habitat assessment will be conducted to identify the main features and overall condition of the site. The US EPA 1997 Ecological Risk Assessment Guidance for Superfund (ERAGS) document will be followed in order to prepare an ecological risk assessment for this site. A screening-level ecological risk assessment (SLERA) will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a baseline ecological risk assessment (BERA) may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard's Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous vegetative connection between any particular wetland area and one or more of the above-specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements as outlined in the attached swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey fieldwork so US EPA can attend, if desired.

5.2.2 Route 561 Dump Site

5.2.2.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil and groundwater contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted.

5.2.2.2 Soil

A topographic survey map of the site has already been completed. This base map will be utilized for mapping site data from the proposed RI/FS activities.

For any borings or wells that will be drilled, a boring log will be completed.

A systematic sampling grid extending from the grid used for the US EPA sampling locations specified in Figure 5-2 shall be used for this first phase of the soil sampling. Soil sampling shall be conducted at each grid node. The grid nodes shall be spaced 50 feet apart. In instances, where a grid node location shall actually extend into Clement Lake, any other water body, or onto a building structure, that grid location shall be located within 2 feet from the obstruction. The sampling grid and the initial sampling points to be sampled shall begin at the following grid locations specified in Figure 5-2: 1, 2, 3, 4, 5, 7, 29, 27, 26, 54, 55, 22, 21, 20, 13, 12, 41, and 10. The grid layout shall extend 150 feet outward past each of the aforementioned grid points in a north, south, west, or east direction (depending on the initial grid point location).

Soil samples will be collected at discreet six inch intervals from three depths at each location: one from the ground surface to approximately 24 inches below ground surface (BGS) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one 6 inches above the water table; and, one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations will be biased based on the observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators.

Five additional sampling locations (Figure 5-2) will be placed directly past the western perimeter of the fence line for the Route 561 Dump Site (i.e., along the eastern side of Lakeview Road). These five additional sampling points will be located within 2 feet of the outside portion of the western side of the fence line and will be parallel to the following US EPA sampling points: 1, 13, 18, 70, and 10. Since the roadway is currently being improved by NJDOT and the curb line is being moved, the actual locations of these borings may have to be reevaluated in the field, in

consultation with US EPA. Since US EPA believes that road work along Lakeview Road has raised the ground elevation just outside of the perimeter fence line, discreet six inch interval soil samples will be collected at four intervals at each location specified above: one from the current ground surface to approximately 24 inches below ground surface (BGS) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one within 6 inches below the current roadway elevation, one 6 inches above the water table; and, one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations will be biased based on observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators.

To refine the on site delineation within the current fence line additional borings will be advanced (Figure 5-2). These additional soil borings will be located halfway between neighboring nodes whenever one exceeded the 400-milligram per kilogram (mg/kg) level for lead and the other did not. Discreet six inch increment soil samples will be collected at three intervals at each location specified above: one from the ground surface to approximately 24 inches below ground surface (BGS) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one 6 inches above the water table; and, one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations will be biased based on observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators.

To confirm the results of the prior US EPA XRF analyses and to provide the confidence level necessary for risk analysis, 10 additional borings will be co-located with the original boring locations used for XRF analysis. The following locations will be re-sampled (Figure 5-2):

US EPA Boring	Sample Interval
44	A,B,C
45	A,B,C
63	A,B,C
60	A,B,C
42	A,B,C
35	A,B,C
33	A,B,C
19	A,B,C
57	A,B,C
25	A,B,C

Discreet six inch increment soil samples will be collected at three intervals at each location specified above: one from the ground surface to approximately 24 inches BGS depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one 6 inches above the water table; and one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations will be biased based on observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators.

The existing analytical data indicate that metals were detected in most of the samples collected to date. All samples will be analyzed for TAL parameters. In addition, 30% of the samples will also be analyzed for TCL parameters. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Lastly, all soil and sediment sampling locations that are situated on residential properties will be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. Prior to initiating field work, a listing of the parameters included in the lists will be submitted to EPA for review and approval.

When possible, pre-cleaned dedicated sampling equipment will be utilized. When that is not possible, equipment will be decontaminated between samples.

5.2.2.3 Groundwater

There are no monitoring wells at the site. To obtain data to assist with well placement, a groundwater screening investigation is proposed (Figure 5-2). A Geoprobe system will be utilized to collect groundwater samples for screening. Groundwater samples will be collected approximately 2 feet below the water table. The screening samples will be analyzed for 100% of the TCL/TAL parameters using a two-week expedited turnaround time.

The results of the groundwater screening and the results of the NJDEP SI will be used in order to determine the location of future wells. The final well locations will be selected in consultation with the US EPA.

Once the sample results are evaluated and the groundwater flow direction established, three wells will be installed at the Route 561 Dump Site along the line defined by the water table gradient between the area of maximum soil contamination and White Sand Branch. One well will be installed upgradient of the maximum contamination (to determine ambient groundwater quality), one will be installed at the Route 561 Dump site, and one will be installed downgradient of the Route 561 Dump site.

The deeper groundwater will be investigated utilizing standard groundwater screening procedures (Hydropunch™, temporary piezometers, etc.). At this time the number of deeper screening borings cannot be estimated. Since any deeper groundwater contamination must have originated in and migrated from the water table zone, the number and placement of borings will be based on the results of the water table investigation. Initially, a screening investigation using temporary well points will be conducted, to provide an initial understanding of the horizontal extent of the contamination. The depth of the deeper saturated zone at this site is not known. Extrapolating from the Paint Works, the deeper saturated zone is expected to occur at 60 to 80 feet BGS. Groundwater samples will be collected 2 feet below the top of the saturated zone. Based on that information, permanent wells will be installed. If the screening investigation indicates no deep zone contamination, one monitoring well will be installed at the downgradient side of the site. If deep zone contamination is indicated, at least three wells will be installed, based on the results of the screening investigation. One well will be installed at the upgradient side of the site and two wells will be installed at the downgradient side of the site.

Only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite). Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using “low-flow” methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval. The need for additional monitoring wells will be assessed based on future observations and review of previous and forthcoming groundwater sampling results.

All new wells will be slug-tested. In addition, one water table and one deeper well will be pump tested. The selection of the pumped and observation wells will be based on the results of the slug test and hydrogeologic information collected during the investigation.

To assist with the development of a groundwater flow model, monthly groundwater elevation measurements will be collected from all existing and new wells for a period of 6 months. To evaluate the relation between surface water and groundwater, gauging stations will be established along White Sand Branch and Haney Run Brook, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements.

When possible, pre-cleaned dedicated sampling equipment will be utilized. When that is not possible, equipment will be decontaminated between samples. Decontamination procedures specified in the US EPA Region 2 Low-Flow SOP (Appendix B of SAP) will be followed as part of the method for collecting low flow ground water samples.

5.2.2.4 Sediment

See discussion under White Sand Branch.

5.2.2.5 Surface Water

See discussion under White Sand Branch.

5.2.2.6 Ecological Assessment

A wetland delineation of the site will be conducted and any identified wetland(s) will be mapped using a GPS instrument with sub-meter accuracy. The wetlands will be delineated in accordance with Federal guidance. Wetland delineation maps and field data sheets will be included to document the delineation activities performed. The New Jersey Freshwater Wetland quarter-quad maps and the Camden County Soil Survey will be used to supplement National Wetland Inventory (NWI) maps and field reconnaissance activities.

A preliminary habitat assessment will also be conducted to identify the main features and overall condition of the site. The US EPA 1997 ERAGS document will be followed in order to prepare an ecological risk assessment for this site. A SLERA will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a BERA may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard's Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous vegetative connection between any particular wetland area and one or more of the above-specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements as outlined in the attached swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements

that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey fieldwork so US EPA can attend, if desired.

5.2.3 White Sand Branch

5.2.3.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil, sediment and surface water contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted. The existing data along White Sand Branch is too sparse for statistical analysis. Therefore, soil and sediment samples will be collected along traverses as described under Section 5.2.3.4 for 100% of the TCL/TAL parameters in order to create a comprehensive data base to determine if a geostatistical model can be run to evaluate if additional sampling may be required or if delineation has not been achieved. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if “hot spots” are identified, or if delineation has not been completed.

5.2.3.2 Soil

A topographic survey map of the site has already been completed (Figures 2-2 & 5-4). This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with submeter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

Soil sampling will be conducted along traverses as described below, in conjunction with the sediment sampling.

5.2.3.3 Groundwater

Groundwater sampling may be necessary, to evaluate groundwater as a contaminant migration pathway, especially if potential sources of contaminants are identified in the flood plain. However, well locations cannot be selected at this time, since the stream bank and flood plain sampling program has not been initiated. The need for groundwater sampling will be assessed after the soils sampling data become available and a proposal will be provided to the US EPA. To the extent possible, data from the United States Avenue Burn Site and the Route 561 Dump Site groundwater investigations will be utilized.

Only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation

parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite). Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using “low-flow” methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval. To evaluate the relation between surface water and groundwater, gauging stations will be established along White Sand Branch and Haney Run Brook, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements.

5.2.3.4 Sediment

Sediment and soil samples will be collected along traverses spaced 200 feet apart, starting at Clement Lake and terminating at United States Avenue (Figure 5-4).

At each traverse, samples will be collected on each embankment of White Sand Branch. Along each traverse, sediment samples will also be taken at approximately 5-foot intervals within White Sand Branch. In instances where the width of White Sand Branch is less than 5 feet, a minimum of one sediment traverse borehole location will be needed within the water body. In instances where the water body of interest loses definition, such as in a wetlands area, samples will be taken at approximately 50-foot intervals starting from the middle of the traverse (or middle of the water body) and ending at the perimeter of the wetlands. This sampling will also be extended into any wetland areas adjacent to the stream course, using the same sampling frequency.

Sampling locations may be added or re-located depending on new observations or on the observation of discolored soils/sediments, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials. In particular, the proposed transects and/or samples will be biased towards depositional “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater discharge zones into the stream, and in the vicinity of previous sampling locations which indicated elevated levels of contamination. If it is not feasible to locate one the traverses at one of these areas, additional samples will be collected.

Sediment samples will also be taken on each side of any culverts and spillways that the White Sand Branch flows through/past (e.g., Lakeview Road, Haddonfield Road, United States Avenue, etc.). In addition, two sediment samples will be taken on each side of the spillway (i.e., four sample locations) from Clement Lake into White Sand Branch. Samples will be collected within 10 feet of the structures, biased towards depositional areas.

Soil samples must be collected at three intervals at each of the borehole locations specified above:

- One from the ground surface to approximately 24 inches below ground surface (bgs) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay);
- One 6 inches above the water table; and
- One in-between the ground surface and the water table.

The cores shall be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval shall be selected based on soil type and biased toward intervals of discolored soil. Sediment samples will be taken at each borehole location at the following depths: one from the surface (0 to 0.5 feet) and one from 1.5 to 2.0 feet below grade. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

All soil and sediment samples will be analyzed for 100% of the TCL/TAL parameters; and, all of the sediment samples will be analyzed for TOC, pH, and grain-size distribution. Soil and sediment sampling locations that are situated on residential properties will remain to be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

5.2.3.5 Surface Water

Surface water samples will be collected at the 12 locations depicted on Figure 5-4 including:

- Clement Lake
- Clement Lake outfall
- Midcourse at the Route 561 Dump site
- Exiting the Route 561 Dump site
- Two locations between the Route 561 Dump site and the United States Avenue Burn site
- Midcourse along the United States Avenue Burn site
- Before exiting the United States Avenue Burn site

Surface water samples will be biased towards “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater discharge zones, existing point source discharges, tributaries, in the vicinity of previous sampling locations which indicated elevated levels of contamination, and placed upstream and downstream of potentially contaminated areas and/or potential sources of contamination.

Two rounds of surface water samples will be collected: one during a dry period (i.e., 10 to 15 days of no precipitation) and one during a wet period (i.e., 10 to 15 days of precipitation events). All surface water samples collected during the above-detailed investigation will be submitted for complete TAL/TCL analyses, total organic carbon (TOC), pH, and hardness.

To the extent possible, surface water sampling locations will be co-located with sediment sampling locations. At those locations, a subset of the sediment samples will be used to produce pore water samples, which in turn will be for the same TAL/TCL and pH parameters as the associated sediment samples.

5.2.3.6 Ecological Assessment

A “desk top” preliminary wetland identification will be conducted for those portions of White Sand Branch not currently encompassed within the fence lines of the Route 561 Dump and the United States Avenue Burn Sites. The wetlands will be identified in accordance with Federal guidance. The New Jersey Freshwater Wetland quarter-quadrant maps and the Camden County Soil Survey will be used to supplement National Wetland Inventory (NWI) maps and limited field reconnaissance activities. Any wetlands that are determined during remedial investigation activities to be affected by site related contaminants, or that could be affected by construction-related activities associated with implementation, if necessary, of a future remedial alternative, will be field delineated in accordance with Federal guidance prior to the ROD.

A preliminary habitat assessment will also be conducted to identify the main features and overall condition of the site. The US EPA 1997 Ecological Risk Assessment Guidance for Superfund (ERAGS) document will be followed in order to prepare an ecological risk assessment for this site. A screening-level ecological risk assessment (SLERA) will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a baseline ecological risk assessment (BERA) may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard's Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous

vegetative connection between any particular wetland area and one or more of the above-specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements as outlined in the attached swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey fieldwork so the US EPA can attend, if desired.

5.2.4 Haney Run Brook

5.2.4.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil, sediment and surface water contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted. The existing data along Haney Run Brook is too sparse for statistical analysis. Therefore, soil and sediment samples will be collected along traverses as described under Section 5.2.4.4 for 100% of the TCL/TAL parameters in order to create a comprehensive data base to determine if a geostatistical model can be run to evaluate if additional sampling may be required or if delineation has not been achieved. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if “hot spots” are identified, or if delineation has not been completed.

5.2.4.2 Soil

A topographic survey map of the site has already been completed. This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with submeter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

Soil sampling will be conducted along traverses as described below, in conjunction with the sediment sampling.

5.2.4.3 Groundwater

Groundwater sampling may be necessary, to evaluate groundwater as a contaminant migration pathway, especially if potential sources of contamination are identified on the flood plain. However, well locations cannot be selected at this time, since the bank and flood plain sampling

program has not been initiated. The need for groundwater sampling will be assessed after the soils sampling data become available and a proposal will be provided to the US EPA. To the extent possible, data from the United States Avenue Burn Site groundwater investigation will be utilized.

Only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite). Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using “low-flow” methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval. To evaluate the relation between surface water and groundwater, gauging stations will be established along White Sand Branch and Haney Run Brook, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements.

5.2.4.4 Sediment

Soil and sediment sampling will be conducted along traverses through and perpendicular to Haney Run Brook and its associated tributaries (Figure 5-3). The traverses will be spaced approximately every 200 feet along the brook and its associated tributaries, and will extend at least 150 feet past sampling point SD-24. Additional sampling may be required if delineation is not achieved.

At each traverse, samples will be collected on each embankment of Haney Run Brook. Along each traverse, sediment samples will also be taken at approximately 5-foot intervals within Haney Run Brook. In instances where the width of Haney Run Brook is less than 5 feet, a minimum of one sediment traverse borehole location will be placed within the water body. In instances where the water body of interest loses definition, such as in a wetlands area, samples will be taken at approximately 50-foot intervals starting from the middle of the traverse (or middle of the water body) and ending at the perimeter of the wetlands. This sampling will also be extended into any wetland areas adjacent to the stream course, using the same sampling frequency.

Sampling locations may be added or re-located depending on new observations or on the observation of discolored soils/sediments, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials. In particular, the proposed samples will be biased towards depositional “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater discharge zones into the stream, and in the vicinity of previous sampling locations which indicated elevated levels of

contamination. If it is not feasible to locate one the traverses at one of these areas, additional samples will be collected.

Soil samples must be collected at three intervals at each of the borehole locations specified above:

- One from the ground surface to approximately 24 inches below ground surface (bgs) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay);
- One 6 inches above the water table; and
- One in-between the ground surface and the water table.

The cores shall be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval shall be selected based on soil type and biased toward intervals of discolored soil. Sediment samples will be taken at each borehole location at the following depths: one from the surface (0 to 0.5 feet) and one from 1.5 to 2.0 feet below grade. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

All soil and sediment samples will be analyzed for 100% of the TCL/TAL parameters; and, all of the sediment samples will be analyzed for TOC, pH, and grain-size distribution. Soil and sediment sampling locations that are situated on residential properties will remain to be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

5.2.4.5 Surface Water

A total of seven surface water samples will be collected with at least three of these surface water samples being collected east of sampling point SD-24 and four of these surface water samples being collected west of SD-24 (Figure 5-3).

Surface water samples will be biased towards “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater seepage, existing point source discharges, tributaries, in the vicinity of previous sampling locations which indicated elevated levels of contamination, and placed upstream and downstream of potentially contaminated areas and/or potential sources of contamination.

Two rounds of surface water samples will be collected: one during a dry period (i.e., 10 to 15 days of no precipitation) and one during a wet period (i.e., 10 to 15 days of precipitation events). All surface water samples will be analyzed for full TCL/TAL, TOC, pH and hardness.

To the extent possible, surface water sampling locations will be co-located with sediment sampling locations. At those locations, a subset of the sediment samples will be used to produce pore water samples, which in turn will be for the same TAL/TCL and pH parameters as the associated sediment samples.

5.2.4.6 Ecological Assessment

A “desk top” preliminary wetland identification will be conducted for those portions of Haney Run Brook not currently encompassed within the fence line of the United States Avenue Burn Site. The wetlands will be identified in accordance with Federal guidance. The New Jersey Freshwater Wetland quarter-quad maps and the Camden County Soil Survey will be used to supplement National Wetland Inventory (NWI) maps and limited field reconnaissance activities. Any wetlands that are determined during remedial investigation activities to be affected by site related contaminants, or that could be affected by construction-related activities associated with implementation, if necessary, of a future remedial alternative, will be field delineated in accordance with Federal guidance prior to the ROD.

A preliminary habitat assessment will also be conducted to identify the main features and overall condition of the site. The US EPA 1997 Ecological Risk Assessment Guidance for Superfund (ERAGS) document will be followed in order to prepare an ecological risk assessment for this site. A screening-level ecological risk assessment (SLERA) will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a baseline ecological risk assessment (BERA) may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard’s Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous vegetative connection between any particular wetland area and one or more of the above-

specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements as outlined in the attached swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey fieldwork so the US EPA can attend, if desired.

5.2.5 Bridgewood Lake

5.2.5.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil, sediment and surface water contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted.

5.2.5.2 Soil

A topographic survey map of the site has already been completed. This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with submeter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

Two sampling lines will be established along the perimeter of Bridgewood Lake with the borehole sampling locations being spaced 50 feet apart in a horizontal direction along each sampling line (Figure 5-5). Sampling along the first line will begin along the embankment of Bridgewood Lake starting parallel to sampling point W0922973 (Rail Road Track site post excavation sampling location). The first sampling line will run along the perimeter of Bridgewood Lake and will not extend 5 feet past the embankment of Bridgewood Lake (i.e., the approximate distance of the aforementioned sampling point, W0922973). Further sampling will expand 300 feet (horizontally) in both directions along the perimeter of Bridgewood Lake from this starting point (i.e., a total length of 600 feet per sampling line). The second sampling line will be placed 5 feet past the first sampling line (i.e., to the right of the first sampling line) along the perimeter of Bridgewood Lake.

Soil samples will be collected at three intervals at each borehole location: one from the ground surface to approximately 24 inches below ground surface (BGS) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of

silt/clay); one 6 inches above the water table; and, one between the ground surface and the water table.

The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

The analytical requirements for these samples will be re-evaluated after the results from the sampling at the Rail Road Track become available to determine if it is appropriate to reduce the sampling parameters from US EPA's original request for 100% TCL/TAL parameters. Soil and sediment sampling locations that are situated on residential properties will remain to be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional "hot spots" such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

5.2.5.3 Groundwater

Two wells will be installed in the wooded area northwest of the Rail Road Site soil-excavation area along a line parallel to the water-table gradient between the area of maximum soil contamination (excavated area) and Bridgewood Lake (Figure 5-5).

Only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite). Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using "low-flow" methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval. The need for additional monitoring wells will be assessed based on future observations and review of previous and forthcoming groundwater sampling results.

All new wells will be slug-tested. In addition, one water table and one deeper well (if installed) will be pump tested. The selection of the pumped and observation wells will be based on the results of the slug test and hydrogeologic information collected during the investigation.

To assist with the development of a groundwater flow model, monthly groundwater elevation measurements will be collected from all existing and proposed wells, for a period of 6 months.

To evaluate the relation between surface water and groundwater, gauging stations will be established along Bridgewood Lake and Hilliard's Creek, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements.

When possible, pre-cleaned dedicated sampling equipment will be utilized. When that is not possible, equipment will be decontaminated between samples. Decontamination procedures specified in the US EPA Region 2 Low-Flow SOP (Appendix B of SAP) will be followed as part of the method for collecting low flow ground water samples.

5.2.5.4 Sediment

An analytical screening program will be implemented, with sampling along traverses spaced every 50 feet or less beginning with the White Sand Branch outflow extending at least 500 feet past the stone dam and spillway (Figure 5-5). Samples will be analyzed for metals using either XRF or a quick-turnaround laboratory. At each traverse soil samples will be collected on each sidewall of the bank of Bridgewood Lake and sediment samples at approximately 50-foot intervals within Bridgewood Lake. In instances where the width of Bridgewood Lake is less than 5 feet, a minimum of one sediment traverse borehole location will be needed within the water body. In instances where the water body of interest loses definition, such as in a wetlands area, samples will be taken at approximately 50-foot intervals starting from the middle of the traverse (or middle of the water body) and ending at the perimeter of the wetland. Sediment samples will be taken at each borehole location at the following depths: one from the surface (0 to 0.5 feet) and one from 1.5 to 2.0 feet below grade.

This screening program will allow the laboratory samples to be placed in the most appropriate locations to assess the nature and extent of contamination in the stream system. After the data is evaluated, the spacing of traverses across Bridgewood Lake will be selected. Previous sediment sampling results will also be used for developing the location of the final sampling locations.

In addition, two sediment samples will be taken on each side of the culvert passing under Gibbsboro Road, two sediment samples from each side of the stone dam and spillway within the Lake, and two sediment samples from the top of the spillway just before the culvert at Gibbsboro Road (i.e., a total of ten sample locations). Sediment samples will be taken at each borehole location at the following depths: one from the surface (0 to 0.5 feet) and one from 1.5 to 2.0 feet below grade.

The proposed transects and/or samples will be biased towards depositional "hot spots" such as depositional areas, on potential areas of groundwater discharge zones, and in the vicinity of previous sampling locations which indicated elevated levels of contamination. If it is not feasible to locate one the traverses at one of these areas, additional samples will be collected.

All samples will be analyzed for TAL parameters, TOC, pH, and grain-size distribution. In addition, 30% of the samples will also be analyzed for TCL parameters. Soil and sediment sampling locations that are situated on residential properties will remain to be analyzed for 100% of the TCL/TAL parameters for all proposed samples collected. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

5.2.5.5 Surface Water

Ten surface water samples will be collected (Figure 5-5). Surface water samples will be appropriately distributed along the lake and be biased towards “hot spots” such as topographic lows, areas of potential groundwater seepage, if present, any existing point source discharges, tributaries, in the vicinity of previous sampling locations where elevated levels of contamination were observed and placed upstream and downstream of potentially contaminated areas and/or potential sources of contamination. All surface water samples will be analyzed for full TCL/TAL, TOC, pH and hardness. Two rounds of surface water samples will be collected: one during a dry period (i.e., 10 to 15 days of no precipitation) and one during a wet period (i.e., 10 to 15 days of precipitation events).

To the extent possible, surface water sampling locations will be co-located with sediment sampling locations. At those locations, a subset of the sediment samples will be used to produce pore water samples, which in turn will be for the same TAL/TCL and pH parameters as the associated sediment samples.

5.2.5.6 Ecological Assessment

A “desk top” preliminary wetland identification will be conducted. The wetlands will be identified in accordance with Federal guidance. The New Jersey Freshwater Wetland quarter-quad maps and the Camden County Soil Survey will be used to supplement NWI maps and limited field reconnaissance activities. Any wetlands that are determined during remedial investigation activities to be affected by site related contaminants, or that could be affected by construction-related activities associated with implementation, if necessary, of a future remedial alternative, will be field delineated in accordance with Federal guidance prior to the ROD.

A preliminary habitat assessment will also be conducted to identify the main features and overall condition of the site. The US EPA 1997 ERAGS document will be followed in order to prepare an ecological risk assessment for this site. A SLERA will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs

and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a BERA may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard's Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous vegetative connection between any particular wetland area and one or more of the above-specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements provided by the FWS. Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey field work so the US EPA can attend, if desired.

5.2.6 Hilliard Creek

5.2.6.1 Existing Data Assessment

Based on the data collected to date, additional investigations are necessary to delineate the extent of soil, sediment and surface water contamination. A SLERA will also be necessary, to evaluate whether a full ecological risk assessment must be conducted. The existing data along Hilliard's Creek is too sparse for statistical analysis. Therefore, soil and sediment samples will be collected along traverses as described under Section 5.2.6.4 below for 100% of the TCL/TAL parameters in order to create a comprehensive data base to determine if a geostatistical model can be run to evaluate if additional sampling may be required or if delineation has not been achieved. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if "hot spots" are identified, or if delineation has not been completed.

5.2.6.2 Soil

A topographic survey map of the site has already been completed. This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with submeter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

Soil samples will be collected along traverses, as detailed in Section 5.2.6.4 below.

5.2.6.3 Groundwater

Groundwater sampling may be necessary, to evaluate groundwater as a contaminant migration pathway. However, well locations cannot be selected at this time, since the bank and flood plain sampling program has not been initiated. A proposal for a groundwater sampling and analysis program will be presented after the proposed soil sampling program has been completed.

If groundwater sampling is deemed necessary, only data from the permanent fully developed monitoring wells will be used in the human health risk assessment. The groundwater samples from the permanent monitoring wells will be analyzed for 100% of the TCL/TAL parameters, temperature, pH, and natural attenuation parameters (iron, manganese, TDS, chloride, hardness, hardness calcium, alkalinity, sulfate, sulfide, TSS and nitrate/nitrite), unless modified in the future based on the results of sediment, soil, and groundwater sampling investigation, and as approved by US EPA. Two rounds of groundwater samples will be collected, spaced 6 to 8 weeks apart. Groundwater samples will be collected using “low-flow” methods (US EPA Region 2 Low-Flow SOP, dated March 1998, Appendix B of SAP). Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval.

To evaluate the relation between surface water and groundwater, gauging stations will be established along Bridgewood Lake and Hilliard’s Creek, at locations to be determined after the well network has been installed. Stream gauge measurements will be taken with every round of groundwater elevation measurements.

5.2.6.4 Sediment

Sampling will be conducted from Foster Avenue and will extend to, and include, the residential property at 1260 Kirkwood Avenue.

Sampling will be conducted along traverses through and perpendicular to Hilliard’s Creek, Kirkwood Lake, a tributary flowing from a man-made pond west of Gibbsboro Road into Hilliard’s Creek, a tributary flowing into Hilliard’s Creek from Bridgewood Lake situated to the east of Gibbsboro Road, a tributary west of 185 Kirkwood Avenue flowing into Hilliard’s Creek, and their 100-year flood plains.

The traverses will be spaced approximately every 50 feet along Hilliard's Creek, Kirkwood Lake, the three aforementioned tributaries, and their 100-year flood plains (Figure 5-6). However, sampling will begin by sampling every fourth traverse, or every 200 feet. Upon receipt of the data, a comprehensive database will be created to evaluate if a geostatistical model can be run to determine if additional sampling may be required or if delineation has not been achieved. If the analyses of the results, including geostatistical analysis, of the first round of samples, collected from the 200 ft traverses, suggests that additional sampling is required, the additional samples will be analyzed only for those parameters identified as contaminants of concern based on the results of the first round of sampling, following EPA approval. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if "hot spots" are identified, or if delineation has not been completed.

At each traverse samples will be collected on both sides of Hilliard's Creek, Kirkwood Lake, and the three aforementioned tributaries. Along each traverse, samples will be taken within Hilliard's Creek, Kirkwood Lake, and the three aforementioned tributaries, from each edge of Hilliard's Creek, Kirkwood Lake's, and the three aforementioned tributaries' banks, and then, samples will be taken at approximately 5 foot intervals along each traverse starting from each edge of Hilliard Creek, Kirkwood Lake, and the three aforementioned tributaries' banks and ending 20 feet past the banks of the water body of interest. In instances where the 100-year flood plain does not extend five (5) feet beyond one of the edges of the water body of interest, a minimum of one sample location will be needed from that side of the water body at a distance no greater than 5 feet from the embankment of the water body. Sediment samples will be taken at approximately 5-foot intervals along each traverse (begin measurement from the embankment of the water body of interest) within Hilliard's Creek, and the three aforementioned tributaries. Sediment samples will be taken at approximately 25-foot intervals along each traverse within Kirkwood Lake (begin measurement from the embankment of the lake). The first sediment sample per traverse within Kirkwood Lake will be taken within 5 feet from the embankment of the Lake. In instances where the width of any of the water bodies is less than 5 feet, a minimum of one sediment traverse borehole location will be taken within the water body. In instances where Hilliard's Creek and the three aforementioned tributaries lose definition, such as in a wetlands area, samples will be taken at approximately 50 foot intervals starting from the middle of the traverse (or middle of the water body) and ending at least 10 feet past the 100-year flood plain. In instances where a traverse sampling location will actually extend onto a building structure, that traverse sampling location will be located within 2 feet of the building structure.

In instances where Hilliard's Creek, Kirkwood Lake, the three aforementioned tributaries, or their 100-year flood plains flow past or encompass a residential property (e.g., 8, 10, 12, 14, 16, and 18 Stevens Drive, 165, 185 and 1260 Kirkwood Avenue, 56 and 68 Gibbsboro Road, and 73 West Road), a minimum of fifteen soil traverse borehole locations per residential property, in addition to the sediment borehole locations within the water body of interest, will be taken. All fifteen soil traverse borehole locations will be located within the 100-year flood plain.

Therefore, the spacing of traverses, within residential property boundaries, may need to be adjusted accordingly to obtain the minimum number of soil traverse borehole locations per residential property. Prior to initiating sampling activities, Sherwin-Williams will interview the property owners or residents as to whether soil or sediments from within the 100-year flood plain have been excavated and moved to other portions of the property. If so, some of the sampling points may be relocated, or additional points may be sampled, to characterize those areas outside of the 100-year flood plain that may have been contaminated. Finally, sampling locations may be adjusted in the field, in consultation with US EPA, if warranted by site conditions (such as ground cover). For the residential property at 165 Kirkwood Avenue, the traverses will extend either 10 feet past the 100-year flood plain or the outer edge of the last cell sampled during the April 2000 sampling event on the property, whichever is the greater distance. However, at this time a removal action is in progress at this property. Depending on the outcome of these activities, the proposed sampling analysis program may need to be revised.

Sediment samples must also be taken on each side of the culverts located within the sampling areas. One of the culverts is located in-between 18 Stevens Drive and 1260 Kirkwood Avenue in Kirkwood Lake. The second culvert is located in the vicinity of a wetland area adjacent to Glenview Drive, which links Kirkwood Lake to Hilliard's Creek. The third culvert runs under Hilliard Road. The fourth culvert runs under Gibbsboro Road (east of the man-made pond towards the Paint Works Corporate Center). Samples will be taken at two borehole locations at each end of these culverts.

Soil samples will be collected at three intervals at each borehole location specified above: one from the ground surface to approximately 24 inches below ground surface (BGS) depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one 6 inches above the water table; and, one between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sediment samples will be taken at each borehole location at the following depths: one from the surface (0 to 0.5 feet) and one from 1.5 to 2.0 feet below grade. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

All samples will be analyzed for 100% of the TCL/TAL parameters, TOC, pH, and grain-size distribution. Prior to initiating field work, a listing of the parameters included in the lists will be submitted to US EPA for review and approval. All the samples from the residential properties will remain to be analyzed for 100% of the TCL/TAL parameters. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional "hot spots" such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.).

Sampling locations may be added or re-located depending on new observations or on the observation of discolored soils/sediments, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials. In particular, data collection will focus on soils/sediments that accumulate in depositional “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater seepage into the stream, and in the vicinity of previous sampling locations which indicated elevated levels of contamination. If it is not feasible to locate one of the traverses at one of these areas, additional samples will be collected.

5.2.6.5 Surface Water

Twenty surface water samples will be collected along Hilliard’s Creek from Foster Avenue and extending into Kirkwood Lake (Figure 5-6). All surface water samples will be analyzed for full TCL/TAL, TOC, pH and hardness. Two rounds of surface water samples will be collected: one during a dry period (i.e., 10 to 15 days of no precipitation) and one during a wet period (i.e., 10 to 15 days of precipitation events).

The surface water samples will be appropriately distributed along the creek and be placed at “hot spots” such as topographic lows, streambed pools, bends in the stream where velocities drop, on potential areas of groundwater discharge zones, existing point source discharges, tributaries, in the vicinity of previous sampling locations which indicated elevated levels of contamination, and placed upstream and downstream of potentially contaminated areas and/or potential sources of contamination.

To the extent possible, surface water sampling locations will be co-located with sediment sampling locations. At those locations, a subset of the sediment samples will be used to produce pore water samples, which in turn will be for the same TAL/TCL and pH parameters as the associated sediment samples.

5.2.6.6 Ecological Assessment

A wetland delineation will be conducted and any identified wetland(s) will be mapped using a GPS with sub-meter accuracy. The wetlands will be delineated in accordance with Federal guidance. Wetland delineation maps and field data sheets will be included to document the delineation activities performed. The New Jersey Freshwater Wetland quarter-quad maps and the Camden County Soil Survey will be used to supplement NWI maps and field reconnaissance activities.

A preliminary habitat assessment will also be conducted to identify the main features and overall condition of the site. The US EPA 1997 ERAGS document will be followed in order to prepare an ecological risk assessment for this site. A SLERA will be prepared when the results of this investigation become available. The SLERA will assist in identifying any additional data needs

and will provide the basis for the problem formulation step of the ERA. Based on the findings of the SLERA, a BERA may be conducted for this area of concern.

The study area for the sites potentially contains populations of the federally listed threatened plant species, swamp pink (*Helonias bullata*). While several walk-throughs of the United States Avenue Burn and Route 561 Dump Sites have been completed over the last five years, there has not yet been a thorough survey of these areas. The Endangered Species Act is an ARAR for these sites and a comprehensive swamp pink survey is the necessary next step in the Endangered Species ARAR process. Therefore, a comprehensive survey for swamp pink will be completed that covers the entire study area.

The swamp pink survey will be completed in areas surrounding Silver Lake, Bridgewood Lake, Clement Lake, White Sand Branch, Haney Run Brook, Hilliard's Creek, Kirkwood Lake and the habitats connecting each of these specified habitats. Additionally, all of the wetland areas in and around these specified habitats will also be surveyed whether or not there is a continuous vegetative connection between any particular wetland area and one or more of the above-specified habitats. A qualified biologist (botanist) will complete the swamp pink survey. In addition to the geographic boundary outlined above, the swamp pink survey will comply with the survey requirements as outlined in the attached swamp pink fact sheet provided by the Fish and Wildlife Service (FWS). Two copies of the survey (with original photographs) will be submitted to the US EPA upon completion for their review and comment. Once the US EPA has determined that the report is acceptable, it will forward the report to the U.S. FWS for their review and comment. The US EPA will notify Sherwin-Williams of any additional requirements that must be met to ensure compliance with the ESA, based upon the results of the survey and the comments provided by the FWS. The US EPA will be advised as to the specific date(s) proposed for the swamp pink survey field work so the US EPA can attend, if desired.

5.2.7 Rail Road Site

5.2.7.1 Existing Data Assessment

A total of 1,960 tons of soils/debris, 2,738 gallons of non-hazardous liquids, and 1,850 gallons of hazardous liquids have been removed from the site during a previous removal action conducted under the oversight of the US EPA Removal Branch. Post-excavation sampling for lead only indicate that most contaminated soils exceeding the 400 mg/kg lead concentration removal clean-up criteria specified in the 1997 Unilateral Administrative Order for Removal Response have been removed with the exception of soils at two locations between the edge of the excavation and Bridgewood Lake and an area between the excavation and United States Avenue. Since post-excavation samples were not required to be collected for any other parameters besides lead for this removal action, final conclusions on the extent of potentially contaminated soils have not been made and the additional sampling specified in this Work Plan will assist in drawing such conclusions.

5.2.7.2 Soil

A topographic survey map of the site has already been completed. This base map will be utilized for mapping site data from the proposed RI/FS activities. Any new borings will be mapped utilizing GPS with sub-meter accuracy.

For any borings or wells that will be drilled, a boring log will be completed.

In addition to the samples that were collected under the oversight of the US EPA Removal Branch, Sherwin-Williams proposes to collect soil samples at each sample point location from 24 inches below the bottom of the excavation interval, at a frequency of one sample point per 900 square-feet of excavation foot-print (Figure 5-9). The samples will be analyzed for the TCL parameters. Secondly, a composite soil sample of the 24-inch interval immediately below the native soil/backfilled soil interface shall be collected at each soil sample point location for all TAL parameters.

In addition, Sherwin-Williams will collect TAL/TCL samples from borings 20 feet away from the perimeter of the former excavation. These borings will be drilled at a rate of one borehole sampling point every 30 linear feet to confirm that delineation is complete for all parameters. From each boring, three samples will be collected: one from the surface to approximately 24 inches BGS depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay), one six inches above the water table, and one in-between the ground surface and the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sample locations will be biased based on observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators.

Additional samples will also be taken to delineate around the localized areas of remaining impacted soils (under roadway and adjacent to Bridgewood Lake).

Four traverses will extend across the roadway from locations W0905974, W0905978, W09059710, and W0904972 (Figure 5-9). Along each traverse, the first sample will be within 12 inches of the post-excavation sampling point (i.e., towards and/or within the right-of way), and each subsequent sample location shall be at 10-foot intervals across the roadway up to the fence line on the eastern side of the U.S. Avenue roadway. Soil samples will be collected at four intervals at each sampling location: one from the ground surface (i.e., below the roadway pavement) to approximately 24 inches BGS depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one at 4 feet BGS; one 6 inches above the water table; and, one in-between the ground surface and the water table. A sample will be collected at 4 feet BGS at each sampling location to fully characterize the extent of the 10 feet lateral length discolored material noted along a section of the roadway

during the post-excavation sampling. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval shall be selected based on soil type and biased toward intervals of discolored soil. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

Four sampling points will be evenly spaced between post-excavation sampling points W09179713 and W0917976, to address the soils below the rail bed. Soil samples will be collected at three intervals at each sampling location: one in-between the layer of bedding not removed during the removal action (i.e., below the point of excavation and backfill) and to approximately 24 inches below the point of excavation and backfill depending on the soil sample being taken (e.g., metals, VOCs, etc.) and the composition of the soil (e.g., percentage of silt/clay); one in-between 24 inches below the point of excavation and backfill and the water table; and one 6 inches above the water table. The cores will be field-screened with a properly calibrated PID/FID or other suitable instrument. If all intervals register the same measurement, the sample interval will be selected based on soil type and biased toward intervals of discolored soil. Sampling locations may be re-located and biased toward the observation of discolored soils, stressed vegetation, odor, drainage patterns, and/or areas suspected of containing contaminated materials.

All of the above samples will be analyzed for 100% of the TCL/TAL parameters. Further, sampling activities for soil and sediment media will include 100% TCL/TAL analyses for all suspect areas of contamination which may fall outside of the proposed sampling grid (e.g., depositional “hot spots” such as topographic lows, streambed pools, bends in water bodies where velocities drop, on potential areas of groundwater seepage into water bodies, etc.).

Delineation of the remaining impacted soils near Bridgewood Lake are addressed under Bridgewood Lake.

5.2.7.3 Groundwater

Installation of groundwater monitoring wells is discussed under the Bridgewood Lake section.

5.2.7.4 Sediment

Sediment sampling is discussed under the Bridgewood Lake section.

5.2.7.5 Surface Water

Surface water sampling is discussed under the Bridgewood Lake section.

5.2.7.6 Ecological Assessment

Ecological assessment is discussed under the Bridgewood Lake section.

5.2.8 Background Location

It will be necessary to establish background conditions for a number of parameters during this investigation. For example, natural or diffuse anthropogenic levels of contaminants of concern may occur in this area. Potential instances include the occurrence of lead and arsenic from the application of pesticides, occurrence of arsenic in glauconitic soils, and the occurrence of metals in groundwater. The need for this information will be evaluated as the investigation progresses. The area surrounding the group of lakes north of Silver Lake (Figure 5-7) is tentatively proposed by Sherwin-Williams, since it is close to the study area, in a similar setting, and is readily accessible. Due to the potential impact of industry it is proposed that the background locations be selected following a field visit with Sherwin-Williams and US EPA personnel and may change from those areas noted in Figure 5-7. Figure 5-7 shows the Known Contaminated Sites in the vicinity of the proposed locations, based on the NJDEP's 2001 list. It does not appear that these sites are undergoing a remedial action under RCRA, but it appears that most have documented impacts to groundwater.

5.2.9 Regional Groundwater

5.2.9.1 Evaluation of Potential Impact to Deeper Aquifers

In order to determine if water wells screened in the PRM and Mt Laurel-Wenonah aquifers can create leakage conditions at the base of the Kirkwood Formation and affect groundwater flow in the Kirkwood-Cohansey aquifer above, an evaluation based on readily available hydrogeologic data will be performed. Specifically, the owner of each of the water supply wells screened in the PRM and Mt. Laurel-Wenonah Aquifers located within one mile of the sites will be contacted. These wells are identified in Figure 3-2 (Water Supply Wells). The owners will be contacted in order to retain information about well hydraulics and the potential presence of well piezometers. This information will be utilized to determine the likelihood of the sites' impact on the Kirkwood-Cohansey aquifer and if additional analysis is required.

5.2.9.2 Residential Well Sampling

Private wells located within 500 feet of any portion of the sites being investigated will be sampled twice over a six-month interval to confirm that groundwater has not been impacted. The 500-foot radius may be expanded based on the results of the sampling, based on further clarification on the groundwater flow direction, and/or based on those aquifers identified as potentially contaminated. If the 500-foot radius area is expanded, it may preferentially be sampled in the downgradient groundwater flow direction, and/or expanded in a preferential direction if Sherwin-Williams can provide sufficient data to identify and define the flow of

groundwater. The private wells to be sampled will be selected from those identified in Section 3.1.3, those private wells used as a potable water source noted under Table 3-1 and Figure 3-3, and Section 5.2.10.2 below.

Well samples will be collected as close to the well head as possible and prior to storage tanks and treatment systems wherever possible. In most cases a plumbing tap in the basement or outside tap will be the sample collection point. Prior to sampling, standing water within the well and plumbing will be evacuated. The tap will be opened and allowed to flow until pH, conductivity, and temperature reach equilibrium.

Samples will be analyzed for 100% of the TCL/TAL parameters. The need for additional samples, or the implementation of an interim measure, or the placement of some of these private potable wells onto a periodic monitoring program will be evaluated based on the results of the sampling activities and the location of, and movement of, any potential groundwater contaminant plumes that may impact these wells' aquifer(s).

5.2.10 Other Data Collection Activities

5.2.10.1 Title Search

The scope of investigations proposed under this Work Plan will extend into properties for which there is no information regarding prior ownership and history. As part of the mobilization activities, a title search will be conducted. The purpose of this activity is to provide supplemental indirect evidence as to the types of activities that may have occurred at the property that may necessitate additional sampling and analysis.

Because of the potentially large number of properties involved, other information, such as historical aerial photography will be utilized to determine whether a title search is necessary. For example, a property that has always been occupied by a house may not require a title search, but a vacant lot with evidence of disturbance will require a title search.

5.2.10.2 Well Search

To ensure that all private wells that are used as a potable water source are identified, for the purpose of the sampling activities described in Section 5.2.9.2 above, the files of the NJDEP will be queried to determine whether additional private wells are present adjacent to the sites. A one-mile radius search around each site will be conducted. Those private wells used as a potable water source located within 500 feet of any portion of the sites being investigated will be added to the monitoring program (i.e., sampling twice over a six-month interval to confirm that groundwater has not been impacted). The 500-foot radius may be expanded based on the results of the sampling, based on further clarification on the groundwater flow direction, and/or based on those aquifers identified as potentially contaminated. If the 500-foot radius area is expanded, it may preferentially be sampled in the downgradient groundwater flow direction, and/or expanded in a preferential direction if Sherwin-Williams can provide sufficient data to identify

and define the flow of groundwater. Samples will be analyzed for 100% of the TCL/TAL parameters.

5.2.10.3 Expanded Topographic Survey

The existing topographic map will be expanded to the west to include the area downstream of the covered bridge on Kirkwood Lake.

5.2.10.4 Vacant Lot Investigation

A soil gas survey, a geophysical survey, and a field screening survey will be conducted in the vacant lot(s) across the street from the Route 561 Dump Site (i.e., the western side of Lakeview Road). The soil gas, geophysical and field screening survey will encompass the area from Lakeview Road to the north/northeast, extend south to Haddonfield/Berlin Road, and extend from the western side of White Sand Branch until the first residential home is reached heading in a western direction towards Marlton Avenue (Figure 5-8).

A 100-foot by 100-foot grid will be established with soil gas samples and XRF samples for all metals being collected at each of the grid nodes. Active soil gas sampling to depths of approximately 6 to 8 feet BGS will be performed at each grid node location. A Geoprobe™ system, equipped with a GC will be utilized for the screening. The probe depth will be reduced if water is encountered. Barometric pressure will be monitored and recorded at regular intervals throughout the survey period. Any required changes to the soil gas survey will be documented. Soil samples will be collected at each grid node location at the surface (0 to 6 inches) and subsurface and will be analyzed for all metals that can be analyzed by XRF. The subsurface sampling depth at each grid node location will be biased based on the soil gas survey and geophysical survey results, observation of discolored soils, stressed vegetation, odor, drainage patterns, areas suspected of containing contaminated materials, field instrument measurements, or other field indicators. The location of some of the XRF metals samples may be re-located based on the results of the geophysical survey. Any re-location of sampling locations from a specific grid node will be documented. Additionally, 10 % of the soil samples will be sent to an analytical laboratory to obtain verification of the field XRF data. Prior to initiating fieldwork, a listing of the metals included in the XRF scan will be submitted to US EPA for review and approval.

The geophysical survey will utilize two methods: magnetometry and frequency-domain electromagnetic induction (FDEMI). The study area will be surveyed with both geophysical methods. Concurrent with geophysical data acquisition, a cultural features maps will be developed, which will detail the location of potential interferences such as buildings, fences, utilities, etc. Magnetometry and FDEMI data will be interpolated to New Jersey State Planar coordinates, and the data shall be extrapolated to a regularly spaced grid system using accepted mathematical methods (contouring).

Based upon the results of these investigations, the need for additional investigations will be evaluated.

5.2.10.5 Evaluation of Waste Characteristics

To support the groundwater modeling and FS activities, it will be necessary to develop an understanding of the waste characteristic properties of any contaminated soils that may require fate and transport modeling, and evaluation of remedial alternatives, respectively.

To develop an understanding of the leaching and migration of contaminants from the soils to the groundwater, Synthetic Precipitation Leaching Procedure (SPLP) testing is proposed. At this time, the number and location of samples that must be collected cannot be adequately estimated and proposed. Upon completion of the proposed investigations, the data will be reviewed to determine which areas require this type of study. Criteria to be utilized will include type and concentration of contaminants, soil type and hydrogeologic setting.

To obtain information relative to the handling options for contaminated soils, to support the FS activities, it will be necessary to know whether soils may exhibit the properties of hazardous waste. For that purpose, soil samples will be analyzed for Waste Characterization Parameters (ignitability, corrosivity, reactivity and TCLP parameters). At this time, the number and location of samples that must be collected cannot be adequately estimated and proposed. Upon completion of the proposed investigations, the data will be reviewed to determine which areas require this type of study. Criteria to be utilized will include type and concentration of contaminants, and soil type.

It is expected that a proposal for these activities will be submitted to US EPA within 4 weeks from receipt of the last analytical data package.

5.2.10.6 Cultural Resources

Since portions of the project area have been developed since the turn of the 19th century a Stage I cultural resource survey (CRS) will be conducted. Typically, a Stage I CRS consists of both a Stage IA CRS (literature search, on-site reconnaissance, and sensitivity study) and a Stage IB CRS (subsurface field investigation). The surveys for this project will be conducted in a phased approach to allow for US EPA's review of the Stage IA CRS prior to the inception of the Stage IB CRS. US EPA will review and comment on the Stage IA CRS to determine if no further cultural resource investigations of the sites are warranted. If US EPA draws such a conclusion, it will notify Sherwin Williams that completion of a Stage IB CRS will not be necessary.

5.2.10.7 Investigation Derived Waste (IDW) Characterization and Disposal

All Investigation Derived Waste (IDW) generated during the field sampling efforts will be characterized and disposed of in accordance with local, state, and federal regulations. All soil cuttings; monitoring well purge/development water; unused samples; decontamination wash/rinse water; unused sample preservation and equipment decontamination fluids; and contaminated

personal protective clothing, debris, and expendables generated on-site during the field investigations will be characterized to determine their appropriate disposition.

Materials determined to be contaminated by hazardous waste will be shipped off-site to an acceptable treatment, storage, or disposal facility (TSDF) for disposal. Materials determined not to be contaminated by hazardous waste will be disposed off-site in accordance with prevailing regulations. Hazardous materials will be accumulated on-site for 90 days or less prior to disposal off-site. Non-hazardous materials will be accumulated on-site for 120 days or less prior to disposal off-site.

5.3 SAMPLE ANALYSIS AND VALIDATION

The environmental samples collected at the site will be analyzed according to US EPA Contract Laboratory Program (CLP) procedures and subjected to a validation program. The samples will be tracked from time of collection through the data validation process to assure that the integrity of the samples is maintained throughout the RI. Data validation will be performed to verify that the analytical results were obtained following the QA/QC protocols specific to the CLP and the QAPP.

5.3.1 Data Validation

Data validation is the assessment of data quality with respect to method requirements and technical performance. Analytical data packages will be examined to ensure that all lab components are included, all QC requirements were performed, and the data use restrictions are well defined. The samples analyzed at CLP laboratories will be subjected to data validation using the US EPA Region II Data Validation (DV) SOPs or the equivalent. The results of the data validation process will be contained in the RI report as a separate appendix.

5.3.2 Sample Tracking

Samples will be tracked during the sampling phase, laboratory analysis process, and data validation program. During sampling, this task will involve ensuring that the proper documentation, chain of custody, and sample transport to the laboratory are performed. Sample tracking will begin at the laboratory at the time when arrangements are made for sample container preparation and shipment. The laboratory will document extraction and analysis dates for tracking purposes. Furthermore, a record of receipt of analytical results, submittal of results for data validation, and completion of data validation will be documented to ensure that validated and final analytical data are distinguishable from data that has not been validated in the RI and FS reports prepared.

5.4 DATA EVALUATION

Data collected during prior sampling programs and data from this RI will be assembled and carefully evaluated to satisfy the objectives of the investigation. Field data and data resulting from laboratory analysis will be entered into a database to facilitate reporting and statistical analysis of data.

Boring logs will be prepared for all completed borings, and stratigraphic information developed from the site borings will be displayed on cross-sections or fence diagrams of the site. Water level elevations measured at the wells will be used to develop plot(s) of the piezometric surface in the aquifers. Both the horizontal and vertical hydraulic gradients will be determined as appropriate.

At many locations the data will be collected on a grid or transect pattern, with the provisions for additional sampling. The data will be analyzed geostatistically, to determine whether additional collection is necessary from a statistical standpoint. Even if the sampling is statistically complete or if an acceptable geostatistical model cannot be produced from the sampling results, additional samples will be collected if “hot spots” are identified, or if delineation has not been completed.

Soil analytical data will be screened against NJDEP soil cleanup screening criteria. Groundwater analytical data will be screened against NJDEP Class IIa GWQS. Surface water analytical data will be screened against US EPA FW CMC and NJDEP FW2 standards. Sediment analytical data will be screened against Ontario Criteria. However, the need for remediation will be based on the results of the risk assessments.

The water quality data will be evaluated and mapped to illustrate the areal extent of contaminants detected. Field permeability characteristics will be evaluated based on slug tests.

Maps of the data from the previous sampling programs and from this RI will be prepared for each medium sampled (i.e., soil, sediment, surface water, etc.) to assist in the analysis. Tables comparing the results of the various phases of the RI will be prepared and evaluated. Where differences are observed, field and laboratory procedures, the passage of time, and other factors will be evaluated to interpret the differences. The results of the evaluation will be discussed in the RI report.

5.5 RISK ASSESSMENT

The assessment of risks posed by the presence of on site contaminants will involve the generation of baseline risk assessments, both human health and ecological. The components of both assessments are described below. The US EPA Superfund guidance will be followed during the preparation of the human health risk assessment, specifically, the *Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)* Interim (US EPA 540-R-97-

033) ("RAGS Part D"). In addition, the following documents are appropriate references to assist in preparing the human health risk assessment:

US EPA, 1989. Risk Assessment Guidance for Superfund (RAGS); Volume I Human Health Evaluation Manual Part A. OERR. US EPA/540/1-89/002. December.

US EPA, 2001. Risk Assessment Guidance for Superfund (RAGS); Volume I, Human Health Evaluation Manual, Part D., Standardized Planning, Reporting, and Review of Superfund Risk Assessments, Publication No. 9285.7-47

US EPA, 1992. Supplemental Guidance to RAGS: Calculating the Concentration Term. OSWER 9285.7-081. May 1992.

US EPA, 2002. Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites. OSWER 9285.6-10.

US EPA, 1991. RAGS Volume I: Human Health Evaluation Manual Supplemental Guidance. Standard Default Exposure Factors. OSWER Directive 9285.6-03. March 25, 1991.

US EPA, 1997. Exposure Factors Handbook - Final, Office of Health and Environmental Assessment, Washington, D.C.

US EPA, 2001. RAGS Volume I: Human Health Evaluation Manual (Part E; Supplemental Guidance for Dermal Risk Assessment), Interim.

5.5.1 Public Health Evaluation

A formal Public Health Evaluation will be conducted in accordance with the Risk Assessment Guidance for Superfund - Human Health Evaluation Manual. The public health evaluation will include the following steps:

- Selection of contaminants of potential concern (COPCs).
- Evaluation of receptors and exposure point concentrations.
- Development of exposure scenarios.
- Characterization of the toxicity potential of COPCs evaluated.
- Generation of risk calculations and discussion on risk outcome.
- Discussion of uncertainties associated with the risk assessment.
- Completion of RAGS Part D tables in accordance with Superfund guidance.

The major steps of the Public Health Evaluation are presented below.

5.5.1.1 Selection of Contaminants of Potential Concern

This activity involves the selection of the contaminants of potential concern (COPCs) from the data collected in the RI in order to quantify risk potential. Data will be grouped by media, and individual sample data for each identified substance will be tabulated. Data usability will be evaluated by comparison with quantification limits, blank contamination, and background levels. Any data rejected will be noted, and reasons for rejection will be documented. Summary statistics and detection frequencies for identified substances in each medium will be compiled. Screening for COPCs will follow the process set forth in the *Risk Assessment Guidance for Superfund Volume I – Human Health Evaluation Manual (Part A)* Interim Final (US EPA/540/1-89/002) (“RAGS Part A”) and US EPA Region 2 policy. Information regarding the selection of COPCs will be presented in Table 2 (or equivalent) of the RAGS Part D tables.

COPCs will be selected from the list of identified substances by following the screening process outlined in RAGS Part A and US EPA Region 2 policy. Substances posing the greatest risk are those that are present at high concentrations, detected frequently, that possess the greatest toxicity potentials (both carcinogenic and noncarcinogenic), and that have the greatest mobility potentials. The screening process may be qualitative or quantitative, as outlined in the Human Health Evaluation Manual.

5.5.1.2 Evaluation of Receptors and Exposure Point Concentrations

This section will discuss how exposure may occur at each site. The land use surrounding each site will be evaluated to develop a conceptual site model (CSM) for each site. The CSM will summarize the current and/or future receptors that could be exposed to the site, their exposure pathways, and the media to which they could be exposed. Potential receptors may include adult and child residents, commercial/industrial workers, trespassers, and recreational users.

Exposure point concentrations (EPCs) will be determined for each receptor and medium consistent with the Superfund guidance outlined in “Supplemental Guidance to RAGS: Calculating the Concentration Term” (Publication 9285.7-08I) and *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*, US EPA 2002, OSWER 9285.6-10. Transport modeling will be used, if needed, in the determination of EPCs. All chemicals identified as COPCs will be carried through the human health risk assessment and carcinogenic risks and noncarcinogenic hazards will be determined.

5.5.1.3 Development of Exposure Scenarios

Exposure scenario development essentially consists of development of models (i.e., algorithms) used to estimate the amount of contaminant that may enter the body. Modeling of exposure potential involves using the information on how the substances may be contacted (detailed in preceding subsection) and then deriving algorithms that estimate the magnitude of exposure over unit time and over a lifetime. Because the amount of contact a current or future resident might have with site-related contaminants will not be known, it is necessary to use assumptions regarding the frequency, duration, and magnitude of exposure. Primary sources of exposure

assumptions will be *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual "Supplemental Guidance"* Interim Final (OSWER Directive # 9285.6-03) and RAGS Part A. The US EPA's *Exposure Factors Handbook* (EFH) will be used after consultation with the US EPA Risk Assessor for exposure pathways not provided in the two primary sources specified above. The rationale used in establishing the exposure scenarios will be documented. A Pathways Analysis Report, which will clearly identify all potential receptors and exposure pathways, including a conceptual site model and lists of exposure assumptions and models, will be submitted to US EPA prior to proceeding with the risk calculations and will include RAGS Part D, Tables 1-6.

Exposure pathways that may be considered, as appropriate, include, but may not be limited to:

- Ingestion and dermal contact with soil
- Ingestion and dermal contact with sediment
- Ingestion and dermal contact with surface water
- Ingestion and dermal contact with groundwater
- Ingestion of plants and/or animals
- Inhalation of volatile organic compounds or particulates/fugitive dust from soil or groundwater

5.5.1.4 Characterization of Toxicity Potential

The carcinogenic and noncarcinogenic toxicity endpoints for each substance evaluated will be obtained. The primary source of such information will be US EPA's Integrated Risk Information System (IRIS), which contains the current cancer potency factors (CPFs) and reference doses (RfDs). For chemicals for which toxicity data are not available on IRIS, US EPA's National Center for Environmental Assessment (NCEA) will be consulted, in consultation with the US EPA risk assessor. It is anticipated that the RfD information needed for the public health evaluation will be that representing chronic exposure.

5.5.1.5 Generation of Risk Calculations and Discussion of Risk Outcome

This segment of the Public Health Evaluation will use exposure algorithms to calculate doses for each receptor. These doses will be used to calculate carcinogenic risks and noncarcinogenic hazards for each receptor and pathway. Cumulative carcinogenic risks and noncarcinogenic hazards, for each pathway and across all pathways, will be presented in a format similar to Tables 7-10 of the RAGS Part D tables. The substances within each pathway contributing to the majority of risk will be identified. In addition, the pathways demonstrating the most risk potential will be noted and discussed.

Risks associated with lead will be evaluated in terms of predicted blood lead levels, using US EPA's IEUBK Model for children and/or USEPA's Adult Lead Model, as appropriate.

5.5.1.6 Discussion of Uncertainties Associated with the Risk Assessment

In most assessments, there are assumptions or data deficiencies that could be challenged. This final segment of the Public Health Evaluation will include a discussion of potential uncertainties in the assessment. This section will present Weston's level of confidence in the risk outcome and the reasons for this level of confidence. The intent of this segment of the Public Health Evaluation will be to identify uncertain areas of the risk assessment and a discussion of factors which may potentially over- or underestimate the risk or hazard, to better inform readers and so that informed remedial action decisions can be made.

5.5.2 Environmental Assessment

The Environmental Assessment includes two distinct steps: Preparation of a SLERA, followed by the preparation of a BERA.

5.5.2.1 SLERA Approach

The overall purpose of a SLERA is to evaluate the need for a quantitative BERA. The purpose of this SLERA will address whether chemicals released to soil with subsequent migration to groundwater, sediment and surface water may pose a potential hazard to ecological receptors. This type of screening is not intended to estimate actual hazard (e.g., adverse effects) to ecological receptors. The methods and assumptions used in this evaluation are intended to identify possible hazards and are designed so that potential risks to ecological receptors are not underestimated.

US EPA's *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (1997b) (hereafter, referred to as the Guidance) will serve as the primary source of guidance in developing the SLERA, although other documents (e.g., NJDEP technical guidance documents) will be consulted as appropriate.

The SCLERA will consist of the following three steps:

- Screening Level Problem Formulation
- Screening Level Effects Evaluation
- Screening Level Exposure Estimate and Risk Calculation

A more detailed discussion for each step listed above is provided below.

5.5.2.2 Specific Elements of the SLERA

5.5.2.2.1 Screening Level Problem Formulation

The culmination of the SLERA is the conceptual model that forms the basis for the refinement of the Problem Formulation step of the BERA and consists of the five steps discussed below.

5.5.2.2.2 Environmental Setting and Contaminants of Potential Concern (COPCs)

Based on available information contained in site reports, which may include maps and aerial photographs, and site visits, a description of the environmental setting for each site will be provided in the SLERA.

5.5.2.2.3 Contaminant Fate and Transport

The major pathways for migration of COPCs at these sites include surface run-off to surface water bodies, potential groundwater discharge into surface water bodies, and transport along surface water bodies. In the screening level risk assessment, specific transport mechanisms will be presented for each drainage area evaluated.

5.5.2.2.4 Ecotoxicity

The ecological risk assessment report will also include, where appropriate, a discussion of the fate and effect characteristics and potential toxicity of important COPCs identified within each drainage area.

5.5.2.2.5 Complete Exposure Pathways and Potential Receptors

For a SLERA evaluation, the available evidence is evaluated to determine whether plants and/or animals are currently exposed, or could potentially be exposed, to contamination at or from the release site. An exposure pathway is the link between a source of a chemical release and a receptor in any medium and by any route. For a pathway to be complete, contaminants must be able to travel from the release source to the receptor, and then be taken up through at least one exposure route (e.g., ingestion, inhalation, direct contact). Complete exposure pathways will be presented for each of the potential receptors (or receptor food guild) within each drainage area. Site-specific potential receptors, including plants, animals, and sensitive habitats that may require protection or special consideration, will be identified. Results from field observations and a Natural Heritage Program search may be used to determine appropriate target species.

For aquatic habitats contaminants can migrate *via* groundwater transport, surface runoff or direct discharge to surface water and sediment. Aquatic and benthic organisms could be potentially exposed to contaminants in sediment or surface water. Furthermore, any terrestrial fauna using the water body and bank areas as a source of food and water and/or as primary habitat could be exposed.

For terrestrial habitats, the primary exposure medium is contaminated soils. Animals may be exposed through direct contact with contaminants in soil, incidental ingestion of contaminants in soil, and ingestion of contaminated food.

Many plant species accumulate certain metals and organic compounds. The process is dependent on soil or sediment characteristics governing bioavailability of individual chemicals. Potential

impacts to plants from chemicals include reduced productivity, inhibition of root and shoot growth, and susceptibility to secondary stresses such as insect infestations and drought. In addition, the potential accumulation of metals and organic compounds in aboveground and belowground plant parts is of concern because of the potential transfer through the food web to higher trophic organisms.

Terrestrial and aquatic macroinvertebrates may also be affected by chemicals in soil and sediments (Hartenstein *et al.*, 1980; Bouche, 1988; Marquenie *et al.*, 1987). Macroinvertebrates are important in terrestrial and aquatic habitats because they:

- are an important food source for many other animals;
- are important in recycling nutrients;
- have wide natural dispersal; and
- have a close relationship with other biomass, e.g., litter, microorganisms and roots.

Impacts to invertebrate communities have far reaching consequences for native vegetative and animal communities. This is because the invertebrate community can alter the nutrient availability and physical characteristics of the soil or sediment, and can potentially transfer chemicals through the food web to higher trophic organisms.

Like the invertebrates, amphibians (i.e., frogs) and reptiles (i.e., snakes) live in close contact with environmental media (i.e., soil, sediment, water) and are particularly susceptible to elevated chemical levels in these media. Furthermore, amphibians and reptiles are dependent on a diet of other receptors equally in close contact with chemicals in soil, sediment, or water. Finally, these receptors are very sensitive to degradation of their habitat (i.e., disappearance of a food source, changes in pond chemistry) and may have difficulty adapting to new environmental conditions.

Numerous species of birds and waterfowl are present at the Site, especially in the wetland areas. Potential pathways of concern for birds include ingestion of chemicals of concern in food items, soil and/or sediments, and surface water, in addition to transfer of chemicals to higher trophic levels or offspring.

Rodents and small mammals are potentially exposed throughout their life as a result of localized ranges and close contact with chemicals in soils. Small mammals, which tend to live in burrows, may be exposed through ingestion of and direct contact with chemicals in soils. Small mammals also consume seeds, vegetative parts, and insects that may have bioaccumulated chemicals. In addition, many small mammals (e.g., mice, voles) form an important food sources for predators.

The following discussion provides a preliminary description of the biological resources, which include plants, animals, and their habitats, likely to be found at and adjacent to the Site. The major habitats are upland areas, open water, emergent wetland, and riparian.

Predominant vegetative species likely present in the emergent wetland and the riparian zone could include Pennsylvania smartweed (*Poligonum spp.*), common reed (*Phragmites communis*),

speckled alder (*Alnus rugosa*), red maple (*Acer rubrum*), willow (*Salix spp.*), hickory (*Carya spp.*), walnut (*Juglans spp.*), apples (*Malus spp.*), boxwood (*Pachistima spp.*), and mulberry (*Morus spp.*).

Wildlife species likely present include common snapping turtle (*Chrysemys p. picta*), muskrat (*Ondatra zibethicus*), beaver (*Castor canadensis*), Canada geese (*Branta canadensis*), mallard ducks (*Anas platyrhynchos*), black duck (*Anas rubripes*), common crows (*Corvus brachyrhynchos*), American robin (*Turdus migratorius*), starling (*Sturnus vulgaris*), great blue heron (*Ardea herodias*), and frogs (*Rana spp.*).

Fish species likely present for the area include pickerel (*Esox niger*), perch (potentially *Perca flavescens*, *Morone americana*, *Aphredoderus sayanus*), chubsuckers (potentially *Erimyzon o. oblongus* and *Castostomus commersoni utawana*), mud minnows (*Umbra pygmaea*), and bass (potentially *Micropterus salmoides*, *M. dolomieu*, *Proximis nigromaculatus*, *Roccus saxatilis*).

5.5.2.2.6 Assessment and Measurement Endpoints for the SLERA

An endpoint is an ecological characteristic (e.g., fish survival) that may be adversely affected by site contaminants (US EPA, 1992b). In the risk assessment process, two distinct types of endpoints are identified: assessment endpoints and measurement endpoints. In the SLERA report suggested measurement and assessment endpoints will be presented as a focus for discussions regarding the next steps to be taken in the risk assessment process (i.e., the baseline risk assessment).

For example, assessment endpoints are any adverse effects on ecological receptors. Adverse effects can be inferred from measurement endpoints associated with impaired reproduction, growth, survival, community structure or function, and ability to support plant and animal populations or communities.

5.5.2.2.7 Screening Level Effects Evaluation

Where possible, for each complete exposure pathway, route, and contaminant, a screening value will be presented. Only readily available benchmark values will be used. Appropriate benchmarks will be selected in consultation with US EPA personnel. Literature searches to identify appropriate no-observable adverse effect levels (NOAELs) or lowest-observable adverse effect levels (LOAELs) will not be completed for this screening level exercise. If benchmarks are not available for a COPC, the project team will contact US EPA to arrive at a decision for addressing this item.

An effects-based screening (i.e., site-specific concentrations are compared with toxicologically-based screening criteria) will be conducted for the potentially complete exposure pathways in aquatic habitats and wetlands. Several effects-based screening criteria for sediment and surface water can be used and include but are not limited to National Oceanic and Atmospheric Administration (NOAA) Effects Range-Low (ER-L) and Effects Range-Median (ER-M), US

EPA's Equilibrium Partitioning (EqP) Criteria for Daphnids, Ontario Ministry of the Environment (MOE) Low and Severe criteria, National Ambient Water Quality Criteria (NWQC), Tier II Water Quality Criteria derived for the Great Lakes, and lowest chronic values reported in the literature for daphnids, non-daphnids invertebrates, and aquatic plants.

An effects-based screening will also be conducted for soils plants, invertebrates and microorganisms (Efroymson *et al.*, 1997a,b) and US EPA's draft ecological soil screening levels (US EPA, 2000).

5.5.2.2.8 Screening-Level Exposure Estimate And Risk Calculation

The screening level exposure estimate and risk calculation is the second step in an SLERA. Risk is estimated by comparing exposure point concentrations with the ecotoxicity screening values discussed above.

5.5.2.2.9 Screening-Level Exposure Estimates

Exposure estimates will be calculated for AOCs where complete exposure pathways exist. For this screening-level assessment, within each drainage area, the arithmetic mean and maximum concentrations of a chemical detected within a medium will be used to compare with benchmarks.

5.5.2.2.10 Screening-Level Risk Calculations

For each medium within a drainage area the ratio of the exposure point concentration (EPC) for the medium and the screening benchmark will be calculated. The approach used for these comparisons simplifies the comparison process and allows for a more standardized interpretation of the results (i.e., the ratio reflects the magnitude by which the concentration exceeds or is less than the guideline or benchmark value). In general, if the ratio exceeds 1 for a COPC, some potential for risk is expected (US EPA, 1993). While the method does not measure risk in terms of likelihood of effects at the individual or population level, it does provide a valid benchmark for judging potential risk (US EPA, 1994).

The primary objective of the uncertainty analysis is to combine and summarize the uncertainty present throughout the steps of the SLERA. This subsection of the risk assessment report will identify, and to the extent possible, quantify the uncertainties present throughout the risk assessment process (e.g., COPC selection, EPC calculation, benchmark derivation). In general, in a screening-level risk assessment, assumed exposure and toxicity parameters are biased toward overestimating risk in order to minimize the chances that no- or negligible risk is concluded when risk does exist.

5.5.2.2.11 Risk Summary

Information regarding uncertainty will be combined with the screening-level risk calculation results to assess the ecological significance of predicted impacts. Recommendations regarding the need for additional data collection and whether to proceed with a BERA will be presented.

5.5.2.3 BERA Approach

Following the SLERA and any necessary additional sampling and analysis, a BERA will be conducted, unless the SLERA indicates that for certain sites or areas a BERA is not warranted.

The BERA will be conducted in conformity with the guidance set forth in US EPA's *Ecological Risk Assessment Guidance for Superfund, Process for Designing and Conducting Ecological Risk Assessments* (US EPA 540-R097-006) and the US EPA 1997 ERAGS guidance will be followed during preparation of an ecological risk assessment for these sites.

The major thrust of the ecological risk assessment will be to use information collected during the environment assessment and the sampling of media during the RI to establish the risk potential to area wildlife. The process will involve the selection of indicator species to establish the risk to ecological components.

The process of conducting an ecological risk assessment is similar to that used in the public health evaluation in that there is a selection of contaminants of concern, a characterization of exposure potential, and a characterization of risk or threat. The process differs, however, in that it is geared to assessment of impact through the use of toxicity indicators other than cancer potency factors and reference doses. Finally, the process leads to conclusions regarding the extent of ecological impact posed by the presence of contaminants at the site and how those impacts influence the need for remediation.

Initially, existing contaminant data and new data to be collected from the area, including the Route 561 Dump site, White Sands Branch, United States Avenue Burn site, Bridgewood Lake, Hilliard Creek, and reference locations will be reviewed. These data include the following media: surface water, sediment, groundwater, and floodplain soils. In conjunction with preparation of the RI report for these sites, a conceptual model of site contamination will be developed, upon which the work plan approach for human health and ecological risk assessment will be based. A portion of the effort under this task will be directed at familiarizing human health risk assessors on the team with the data set.

Based on the results of the data review, a preliminary work plan will be prepared outlining the general approach to be adopted with respect to assessment of human health and ecological risks at these sites. The preliminary work plan will provide the basis for discussions with US EPA and other agencies regarding the risk assessment approach to be taken, during the "Problem Formulation" stage of the risk assessment process.

The preliminary work plan would provide a description of how the following would be conducted:

- Initial screening of contaminants in the above media to identify COPCs.
- Baseline risk assessment for human health and ecological receptors based on an exposure assessment that would identify target receptors/exposure, and that would include hazard quotient modeling for those target receptors for the contaminants of concern and for each pathway of concern.
- Use of a tiered approach toward assessment that would result in realistic site cleanup criteria for media of concern.
- Use of additional data (e.g., background contamination data, future land use projections, etc.) during the risk management stage of the assessment to be incorporated into remedial recommendations. This will include the potential use of all aquifers designated by the state as a potable water supply, which are located within the study area.
- Integration of human health and ecological issues to agree upon suitable site cleanup criteria for each medium of concern.
- Completion of a field investigation for the identification of Swamp Pink colonies.

5.6 TREATABILITY STUDIES - PILOT TESTING

The preliminary scoping of the FS involves the identification of both established and innovative remedial technologies for addressing on site contamination. Technologies that meet remedial action objectives and pass an initial screening may require treatability studies, either in the laboratory or in the field. The purpose of these studies will be to evaluate the applicability, reliability, and cost-effectiveness of the technologies to the site and to develop engineering design/cost information for the technologies to facilitate a comparative evaluation.

5.7 REMEDIAL INVESTIGATION REPORTS

After completion of the field investigation program, a Draft RI Report will be prepared and submitted to US EPA for review. A draft outline of the report is shown in Appendix G. This outline should be considered a proposed draft and subject to some revision, based on the findings of this RI. Each section of the report will be subdivided to discuss different areas or operable units at the site. The Draft RI Report will include a discussion of the data from the previous sampling programs, where appropriate, and the data and analyses performed as part of this RI.

5.8 REMEDIAL ALTERNATIVES DEVELOPMENT AND SCREENING

After data from the existing database and that collected during the RI are evaluated, the preliminary remedial action objectives will be refined if appropriate. Based on the revised remedial response objectives and the results of the risk assessment, the initial screening of remedial alternatives will be performed according to the procedures recommended in "Guidance and Feasibility Studies under CERCLA" and "Guidance for Conducting RI/FS under CERCLA".

According to the latest guidance (US EPA, 1988), the development of alternatives will be performed concurrent with the RI. This Work Plan includes a preliminary identification and discussion of alternatives, although the process of identifying and screening potential alternatives will be ongoing throughout the RI, as new technological and/or site-specific data emerge. This task will accomplish the following objectives:

- Development of remedial response objectives and general response actions;
- Identification and screening of remedial technologies, and process options; and
- Development and screening of remedial alternatives.

5.8.1 Development of Remedial Action Objectives and General Response Actions

Based on data collected in the RI along with other existing data, the remedial action objectives will be developed. Prior to the development of these objectives, any significant risks and contaminant pathways will be identified. Considering these risks and pathways, the remedial response objectives would eliminate or minimize substantial risks to public health and the environment will be developed further, including a refinement of the ARARs with consideration given to site-specific conditions. Based on the response objectives, general response actions will be delineated to address each of the site problem areas and to meet the cleanup goals and objectives. These response actions will form the foundation for the screening of remedial technologies. General response actions considered will include the "No Action" alternative as a baseline against which all other alternatives can be compared.

5.8.2 Identification and Screening of Applicable Technologies and Development of Alternatives

Based on the remedial action objectives and each identified general response action, potentially applicable treatment and disposal alternatives will be identified. A prescreening of these potential treatment technologies for suitability as part of a remedial alternative will be conducted. Where several process options exist for a particular technology (e.g., generic kiln, infrared or circulating bed combustion), the process option for which most data exist and whose capacities/constraints match site conditions will be selected for further detailed evaluation. Final process selection may occur during the remedial design.

Technologies, which may prove extremely difficult to implement, may not achieve the remedial objective in a reasonable time, or are not applicable and not feasible based on the site-specific conditions will be eliminated from further consideration.

A preliminary identification of technologies has been completed; the results of this activity are presented in Subsection 3.4 - Preliminary Identification of Remedial Action Alternatives. However, this preliminary identification will be revisited based on the results of the RI and the revised remedial response objectives.

The development of alternatives requires combining appropriate remedial technologies that were retained after the screening step in a manner that will satisfy the site remediation strategies or response objectives and refined based on the results of the RI. As required by SARA, remedial alternatives will be developed in each of the following categories:

- An alternative for treatment that would eliminate, or minimize to the extent feasible, the need for long-term management (including monitoring) at the site.
- Alternatives that would use treatment as a primary component of an alternative to address the principal threats at the site.
- An alternative that relies on containment, with little or no treatment, but that is protective of human health and the environment by preventing potential exposure and/or by reducing mobility.
- A "No Action" alternative.

Additionally, based on the results of the RI, the development of remedial alternatives may consider operable units as appropriate. The consolidation of operable units may also be considered, if appropriate.

5.8.3 Screening of Remedial Alternatives

The list of potential remedial alternatives developed will be screened. The objective of this effort is to reduce the number of technologies and alternatives for further analysis while preserving a range of options. This screening will be accomplished by evaluating alternatives on the basis of effectiveness, implementability and estimated cost as specified in the most recent US EPA guidance document (US EPA, 1988). These screening criteria are briefly described below.

5.8.3.1 Effectiveness Evaluation

The effectiveness evaluation will consider the capability of each remedial alternative to protect human health and the environment. Each alternative will be evaluated as to the protection it would provide, and the reductions in toxicity, mobility or volume of contaminants, which it would achieve.

5.8.3.2 Implementability Evaluation

The implementability evaluation will be used to measure both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. In addition, the availability of the technologies involved in a remedial alternative will also be considered.

Innovative technologies will be considered during the screening process if there is a reasonable belief that they offer potential for better treatment performance or implementability, fewer adverse impacts than other available approaches, or lower costs than demonstrated technologies.

5.8.3.3 Cost Evaluation

Cost evaluation will include estimates of capital costs, annual operation and maintenance (O&M) cost, and present-worth analysis. These conceptual cost estimates are order-of-magnitude estimates, and will be prepared based on:

- Preliminary conceptual engineering for major construction components.
- Unit costs of capital investment and general annual operation and maintenance costs.

5.8.4 Detailed Evaluation of Remedial Alternatives

5.8.4.1 Evaluation Criteria

The remedial alternatives that pass the initial screening will be further evaluated. The evaluation will consist of a technical, environmental and cost evaluation as well as an analysis of other factors, as appropriate. The detailed evaluation will follow the process as specified in the "Guidance on Feasibility Studies under CERCLA", Memoranda on "Interim Guidance on Superfund Selection of Remedy", and "Guidance for Conducting RI/FS under CERCLA".

A set of nine evaluation criteria has been developed for the evaluation of each Remedial Alternative. These criteria are listed below.

- 1. Short-Term Effectiveness**
 - Protection of community during remedial actions
 - Protection of workers during remedial actions
 - Time until remedial response objectives are achieved
 - Environmental impacts
- 2. Long-Term Effectiveness**
 - Magnitude of risk remaining at the site after the response objectives have been met
 - Adequacy of controls
 - Reliability of controls
- 3. Reduction of Toxicity, Mobility or Volume**
 - Treatment process and remedy
 - Amount of hazardous material destroyed or treated
 - Reduction in toxicity, mobility or volume of the contaminants
 - Irreversibility of the treatment
 - Type and quantity of treatment residuals
- 4. Implementability**
 - Ability to construct technology
 - Reliability of technology
 - Ease of undertaking additional remedial action, if necessary
 - Monitoring considerations
- Coordination with other agencies
 - Availability of treatment, storage capacity, and disposal services
 - Availability of necessary equipment and specialists
 - Availability of prospective technologies
- 5. Cost**
 - Capital costs
 - Annual operating and maintenance costs
 - Present work analysis
 - Sensitivity analysis
- 6. Compliance With ARARs**
 - Compliance with chemical-specific ARARs
 - Compliance with action-specific ARARs
 - Compliance with location-specific ARARs
 - Compliance with appropriate criteria, advisories and guidance
- 7. Overall Protection of Human Health and Environment**
- 8. State Acceptance**
- 9. Community Acceptance**

A brief description of each criterion is provided below:

5.8.4.2 Short-Term Effectiveness

This criterion addresses the effects of the alternative during the construction and implementation phase until the remedial actions have been completed and the selected level of protection has been achieved. Each alternative will be evaluated with respect to its effects on the community and on site workers during the remedial action, environmental impacts resulting from implementation, and the amount of time until protection is achieved.

5.8.4.3 Long-Term Effectiveness

This criterion addresses the results of a remedial action in terms of the risk remaining at the site(s) after the response objectives have been met. The primary focus of this evaluation is to determine the extent and effectiveness of the controls required to manage the risk posed by treatment residuals and/or untreated wastes. The factors to be evaluated include the magnitude of remaining risk (measured by numerical standards such as cancer risk levels), and the adequacy, suitability, and long-term reliability of management controls for providing continued protection from residuals (i.e., for assessment of potential failure of the technical components).

5.8.4.4 Reduction of Toxicity, Mobility, or Volume

This criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility or volume of the contaminants. The factors to be evaluated include the treatment process employed, the amount of hazardous material destroyed or treated, the degree of reduction expected in toxicity, mobility or volume, and the type and quantity of treatment residuals.

5.8.4.5 Implementability

This criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. Technical feasibility will consider construction and operational difficulties, reliability, ease of undertaking additional remedial action (if required), and the ability to monitor its effectiveness. Administrative feasibility will consider activities needed to coordinate with other agencies (e.g., state and local) in regards to obtaining permits or approvals for implementing remedial actions.

5.8.4.6 Cost

This criterion will address capital costs, annual operation and maintenance costs, and present work analysis.

Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor, and material necessary to perform remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities but are required to complete the

installation of remedial alternatives. Annual operation and maintenance costs are post-construction costs necessary to ensure the continued effectiveness of a remedial action. These costs will be estimated to provide an accuracy of + 50% to -30%.

A present-worth analysis will be performed to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year (e.g., usually the current year). This will allow the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money sufficient to cover all costs associated with the remedial action over its planned life. As suggested in the US EPA's guidance (1988), a discount rate of 5% will be considered unless the market values indicate otherwise during the performance of the FS.

5.8.4.7 Compliance with ARARs

This criterion will be utilized to determine how each alternative complies with applicable or relevant and appropriate federal and state requirements, as defined in CERCLA Section 121.

5.8.4.8 Overall Protection of Human Health and Its Environment

This criterion will provide a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under the evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.

5.8.4.9 State Acceptance

This criterion will evaluate the technical and administrative issues and concerns the State of New Jersey may have regarding each of the alternatives. The factors to be evaluated include those features of alternatives that the state supports, reservations of the state, and opposition of the state.

5.8.4.10 Community Acceptance

This criterion will incorporate public concerns into the evaluation of the remedial alternatives.

After each of the remedial alternatives has been evaluated against the nine criteria, a comparative analysis will be performed. This analysis will compare all the remedial alternatives against each other for each of the nine evaluation criteria.

5.9 FEASIBILITY STUDY REPORT

5.9.1 FS Report Preparation

An FS report will be prepared to summarize the activities performed and to present the results and associated conclusions for Sections 5.1 through 5.10. The report will include a summary of laboratory treatability findings (if performed), a description of the initial screening study process and the detailed evaluations of the remedial action alternatives studied. The FS report will be prepared and presented in the format specified in "Guidance for Conducting RI/FS under CERCLA".

The FS report will be comprised of an executive summary and four sections. The executive summary will be a brief overview of the FS and the analysis underlying the remedial alternatives, which were evaluated.

The FS will contain the following five sections:

- Introduction and Site Background
- Identification of ARARs
- Identification and Screening of Remedial Technologies
- Development and Initial Screening of Remedial Alternatives
- Description and Detailed Analysis of Alternatives

A discussion of each component is presented below. The format proposed for use in developing the FS Report is presented in Appendix F. The actual outline to be used in the development of the FS Report will be submitted to the US EPA for approval prior to beginning the actual writing of the Draft FS Report.

The introduction will provide background information regarding site location, facility history and operation, and the nature of the problem, as identified through the various studies. A summary of geohydrological conditions, remedial action objectives, the nature and extent of contamination, and risk assessment addressed in the RI report will also be provided. The feasible technologies and process options for site remediation will be identified for each general response action, and the results of the remedial technologies screening will be described.

Remedial alternatives will be developed by combining the technologies identified in the previous screening process. The results of initial screening of remedial alternatives, with respect to effectiveness, implementability and cost, will be described.

A detailed description of the cost and non-cost features of each remedial action alternative passing the initial screening of the previous section will be presented. The detailed evaluation of each remedial alternative with respect to the nine evaluation criteria will be presented. A comparison of these alternatives will also be presented.

5.10 PROJECT MANAGEMENT PLAN

5.10.1 Data Management

Sherwin-Williams maintains a relational database system for storing and retrieving analytical data from remedial and other investigations. The data are maintained in tables generated by MS Access TM. Data from this investigation will be entered and managed in this database. At a minimum, the following information will be stored:

- Sample Location
- Sample Identification
- Sample Collection Date
- Sampling Interval (for soil/sediment)
- Parameter
- Result
- Qualifier
- Method Detection

In addition to hard-copy format, data will be obtained from the laboratory in electronic format, to be incorporated into the database. By obtaining an electronic deliverable, the chance for errors due to manual entry is negated.

Information stored in the database will be utilized to produce data tables necessary for the various reports. Data can either be directly tabulated or exported to other programs for further analysis (e.g., statistical analysis software). As necessary, data can also be converted to common export format (such as ASCII delimited and DBF) and provided to US EPA.

For purposes of data visualization a Geographic Information System (GIS) will be utilized. A base map in State Planar Coordinate System (NAD 83) will be utilized for plotting the data. All GPS and survey data will be in State Planar coordinates, so that it can be directly overlain on the base map. Data from the project database will be extracted and linked to the GIS basemap to create themes and coverages necessary to visualize and analyze the data. While the actual coverages and themes will be determined as the data becomes available and as dictated by the needs of data analysis, the following themes will likely be compiled:

- Soil sampling results (by depth)
- Exceedance of soil cleanup criteria (by depth)
- Groundwater analytical results (by event)
- Exceedance of groundwater quality standards (by event)
- Other analytical data maps

Coverages will also indicate what samples were obtained during a sampling event that did not exceed applicable criteria in order to ascertain the total number of samples taken during each sampling episode.

The GIS software utilized for these operations is ArcView™. ArcView coverages will be provided to US EPA as requested. If the use of other software becomes necessary, shapefiles or ESRI export files will be provided, both of which are recognized by ArcView.

5.10.2 Periodic Reports

In accordance with terms of the AOC, monthly progress reports will be submitted to the US EPA on the 15th of each month. These reports will address the following:

1. Activities conducted during the reporting period
2. Results of sampling, testing, etc. generated during the reporting period
3. Activities scheduled for the following two months
4. Percent completion

The AOC also specifies the following periodic reports, which must be presented in addition to the main deliverables:

1. Site Characterization Summary Report and Presentation – This will provide a summary of the findings of the RI, prior to submitting the RI Report.
2. Identification of Candidate Technologies – A technical memorandum will be submitted presenting candidate technologies for inclusion in the FS.
3. Memorandum of Exposure Scenarios and Assumptions – A technical memorandum will be prepared, describing the exposure scenarios and assumptions that will be utilized in the risk assessment.
4. Toxicological and Epidemiological Studies Memorandum – A technical memorandum will be submitted listing the epidemiological and toxicological studies that will be utilized for the toxicity assessment for chemical lacking US EPA toxicity values.
5. Presentation of Remedial Action Objectives and Alternatives – A presentation will be made to US EPA during which the Remedial Action Objectives will be identified and the proposed Remedial Alternatives will be discussed.

SECTION 6.0

SCHEDULE

The proposed schedule is presented on Figure 6-1.

This schedule is based on the following assumptions:

- Minimum Number of samples as listed below:

Matrix	Estimated Number of Samples
Soil	3,319
Sediment	1,608
Groundwater (screening)	25
Groundwater (monitoring wells)	70
Surface Water	220

This does not account for a potentially extensive second round of investigations.

- Two to three field crews will be deployed at a time to provide for activity overlap.
- The sampling program will be conducted largely in undeveloped wooded and wetland areas, that expected to restrict access and inhibit the rate of production.
- It is assumed that efforts will be made to minimize destruction of wetlands and wooded areas for the purpose of obtaining access to the sampling locations
- The two rounds of surface water sampling can be conducted within 8 weeks from one another.
- It is assumed that US EPA comments will be incorporated into the next major deliverable.
- A 1 month US EPA review period has been assumed.
- The deliverables' schedule outlined in the AOC was utilized as a guide establishing the deliverable deadlines presented in this schedule. However, the 18-month schedule required in the AOC was not met. The number of sampling locations and amount of data that must be reviewed and interpreted is well beyond that envisioned at the time of the signing of the AOC. While theoretically it may be possible to execute this work in 18 months, the degradation in quality and data reliability would be significant and would jeopardize the success of the RI/FS program. As shown on Figure 6-1, the currently proposed schedule requires 30 months to complete the work.

SECTION 7.0

PROJECT MANAGEMENT

The project organization, line of authority, and the responsibility of individuals participating in the investigation are described below. Table 7-1 presents a list of the key contacts with salient information concerning each.

Sherwin-Williams Corporate Director of Environmental, Health and Regulatory Services – John Gerulis

The Sherwin-Williams Corporate Director of Environmental, Health and Regulatory Services is responsible for the overall direction of the project and for ensuring that the objectives of the RI/FS program are met. The Sherwin-Williams Corporate Director of Environmental, Health and Regulatory Services represents the commitment of the Corporation to this project.

Sherwin-Williams Corporate Director of Remediation Services – Mary Lou Capichioni

The Sherwin-Williams Corporate Director of Remediation Services is the day-to-day point of contact with US EPA and provides technical and QA/QC support to the Sherwin-Williams Corporate project team. She is responsible for the day-to-day management and execution of the project, and supervises the in-house staff and the contractors supporting Sherwin-Williams in this program.

Project Director – Sally Jones, P.G. (Weston)

The Project Director is responsible for overall project direction for Weston and is directly accountable to Weston's and Sherwin-Williams' corporate management for the progress of the program.

Program Manager – Daniel Kopcow (Weston)

The Program Manager is responsible for day-to-day project management and coordination of Weston staff and subcontractors, including scheduling and reporting, and ensuring that all necessary Weston resources are provided and applied to the project.

Technical Director – Arthur Fischer (Weston)

The Technical Director is responsible for addressing/resolving technical issues as they arise, supervising and reviewing technical applications and interpretations relating to the project.

Project QA Officer – Laura Amend-Babcock (Weston)

The Project QA Officer is responsible for ensuring conformance with Weston and US EPA policies, procedures, and sound practices during the project planning (i.e., preparation of the QAPP and HASP) and report tasks. The QA Officer is also responsible for conducting field audits and ensuring that the procedures identified in this QAPP are followed.

Field Team Leader – Patrick Austin (Weston)

The Field Team Leader is responsible to ensure the investigation is completed consistent with the Work Plan and QAPP. The Field Team Leader will document all activities, monitor health and safety compliance, and interact with the project manager and US EPA RPM and/or OSC as required.

Data Validation – Yunru Yang (Weston)

The Data Validator is responsible for checking the sampling data from the laboratory to ensure the laboratory followed all of the appropriate and required quality assurance and quality control procedures.

Geostatistical Analysis Coordinator – Teresa Bowers, Ph.D. (Gradient Corp.)

The Geostatistical Analysis Coordinator is responsible for overseeing this portion of the program and to ensure that the analysis is conducted in a timely manner and provides the data necessary for the uninterrupted progress of the program.

Sampling Task Manager – Gilberto Mello (Weston)

The Sampling Task Manager is responsible for implementation of the QAPP; mobilization and coordination of field activities; sample collection, handling, and documentation; and field documentation.

Engineering Manager – William Lowe, P.E. (Weston)

The Engineering Manager is responsible for coordinating and reviewing the Feasibility Study activities.

Risk Assessment Manager – Teresa Bowers, Ph.D. (Gradient Corp.)

The Risk Assessment Manager oversees and coordinates the activities of the Human Health Risk Assessment and the Ecological Risk Assessment and reviews deliverables.

Health and Safety Officer – Alanna Garrison (Weston)

The Health and Safety Officer is responsible for the coordination and implementation of the Health and Safety Plan at the sites.

Laboratory Project Manager – Eric Lang (STL)

The Laboratory Project Manager is responsible for maintaining the laboratory schedule, ensuring that the laboratory understands technical requirements, and ensuring that project deliverables are submitted on time and in the required format. The Laboratory Project Manager is the primary contact for laboratory-related issues.

Laboratory Manager – Mike Healy (STL)

The Laboratory Manager has the responsibility to see that all tasks performed in the laboratory are conducted according to the requirements of this QAPP.

Laboratory QA Officer – Ray Frederici (STL)

The Laboratory QA Coordinator has oversight responsibility for implementation of the quality assurance objectives. These responsibilities include the following:

- Ensure that QA objectives of this QAPP are met.
- Submit performance samples for analysis appropriate to laboratory analytical requirements at least annually.
- Provide an internal audit of representative analytical data reports.
- Perform an internal laboratory systems audit at least semiannually.
- Coordinate on-site QA laboratory audits and ensure that any questions regarding QA requirements are resolved.

SECTION 8.0

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Appendix A

Historical Waste Analyses Data

Appendix B

Zoning Maps

Appendix C
Kaselaan & D'Angelo Report

Appendix D
Wetland Delineation Report

Appendix E
Residential Well Analytical Results

Appendix F
Railroad Track Site Map

Appendix G
RI and FS Report Sample Table of Contents

Appendix H

Historic Maps

PROPOSED RI REPORT FORMAT

Executive Summary

1.0 Introduction

1.1 Purpose of Report

1.2 Site Background

1.2.1 Site Description

1.2.2 Site History

1.2.3 Previous Investigations

1.3 Report Organization

2.0 Study Area Investigation

2.1 Surface Features (topographic mapping, etc.)

2.2 Contaminant Source Investigations

2.3 Surface Water and Sediment Investigations

2.4 Soil and Vadose Zone Investigations

2.5 Groundwater Investigations

2.5 Ecological Investigations

3.0 Physical Characteristics of the Study Area

3.1 Surface Features (topographic mapping, etc.)

3.2 Contaminant Source Investigations

3.3 Surface Water and Sediment Investigations

3.4 Soil and Vadose Zone Investigations

3.5 Groundwater Investigations

3.5 Ecological Investigations

4.0 Nature and Extent of Contamination

4.1 Sources

4.2 Soils and Vadose Zone

4.3 Groundwater

4.4 Surface Water and Sediments

5.0 Contaminant Fate and Transport

5.1 Potential Routes of Migration (i.e., air, groundwater, etc.)

5.2 Contaminant Persistence

5.3 Contaminant Migration

6.0 Baseline Risk Assessment

6.1 Public Health Evaluation

6.1.1 Exposure Assessment

6.1.2 Toxicity Assessment

6.1.3 Risk Characterization

6.2 Environmental Assessment

7.0 Summary and Conclusions

7.1 Summary

7.1.1 Nature and Extent of Contamination

7.1.2 Fate and Transport

7.1.3 Risk Assessment

7.2 Conclusions

7.2.1 Nature and Extent of Contamination

7.2.2 Recommended Remedial Action Objectives

Appendices

A. Boring Logs

B. Hydrogeologic Data

C. Analytical Data and QA/QC Evaluation Results

D. Risk Assessment Methods

E. Toxicity Profiles

PROPOSED FS REPORT FORMAT

Executive Summary

1.0 Introduction

- 1.1 Purpose and Organization of Report
- 1.2 Background Information (Summarized from RI Report)
 - 1.2.1 Site Description
 - 1.2.2 Site History
 - 1.2.3 Nature and Extent of Contamination
 - 1.2.4 Contaminant Fate and Transport
 - 1.2.5 Baseline Risk Assessment

2.0 Identification of ARARs

- 2.1 Technical Specific
- 2.2 Action Specific
- 2.3 Location Specific

3.0 Identification and Screening of Technologies

3.1 Introduction

- 3.2 Remedial Action Objectives -- Presents the development of remedial action objectives for each medium of interest (i.e., ground water, soil, surface water, air, etc.). For each medium, the following should be discussed: - Contaminants of interest - Allowable exposure based on risk assessment - Allowable exposure based on ARARs - Development of remedial action objectives
- 3.3 General Response Actions -- For each medium of interest, describe the estimation of areas of volumes of which treatment, containment, or exposure technologies may be applied.
- 3.4 Identification and Screening of Technology and Process Options -- For each medium of interest, describes:
 - 3.4.1 Identification and Screening of Technologies
 - 3.4.2 Evaluation of Technologies and Selection of Representative Technologies

4.0 Development and Screening of Alternatives

- 4.1 Development of Alternatives -- Describes rationale for combination of technologies/media into alternatives. Note: This discussion may be by medium or for the site as a whole.
- 4.2 Screening of Alternatives

4.2.1 Introduction

4.2.2 Alternative 1

4.2.2.1 Description

4.2.2.2 Evaluation - Effectiveness - Implementability - Cost

4.2.3 Alternative 2

etc...

4.2.5 Summary of Screening

5.0 Detailed Analysis of Alternatives

5.1 Introduction

5.2 Individual Analysis of Alternatives

5.2.1 Alternative 1

5.2.1.1 Description

5.2.1.2 Assessment

Overall Protection

Compliance with ARARs

Long-Term Effectiveness and Permanence

Reduction of Mobility, Toxicity, or Volume Through Treatment

Short-Term Effectiveness

Implementability

Cost

State Acceptance

Community Acceptance

5.2.2 Alternative 2

5.2.2.1 Description

5.2.2.2 Assessment

5.2.3 Alternative 3

6.0 Comparative Analysis

6.1 Overall Protection

6.2 Compliance with ARARs

6.3 Long-Term Effectiveness and Permanence

6.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

6.5 Short-Term Effectiveness

6.6 Implementability

6.7 Cost

6.8 State Acceptance

6.9 Community Acceptance

TABLES